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VIEWS, NEWS AND INTERVIEWS.

In answer to a request from a New York export association for information as to prices of, and agencies for, the sale of incandescent electric lamps in Japanese markets, United States Consul-General Gowey sends the following from Yokohama, dated September 1, 1898:

Almost every prominent American and European manufacturer of these goods is represented here either by specially appointed agents or by correspondents.

The Edison-Swan Company (British), Siemens & Halske, Severin Senator and the General Electric Company (German) may be mentioned as leading European concerns here who, by their agents, are making strong efforts to secure a large share of the trade.

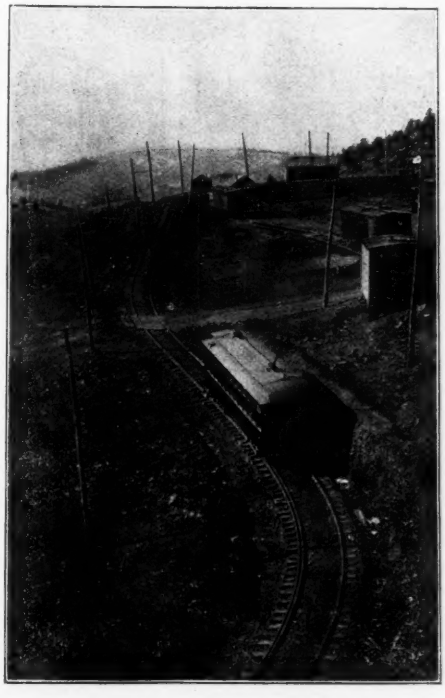
German 16 candle-power lamps, guaranteed for 1,000 hours, have been offered here for 6d. (12 cents) apiece. American and other lamps of the same quality are now selling here for 32 sen (16 cents in United States currency) each. This unusually low price is the result of over competition, and will probably be of short duration.

A well known London dealer in mummies is reported to be making good use of the X rays in order to prevent the Egyptians from swindling him with "fake" mummies. There are certain internal marks beneath the cloth in which mummies are wrapped which are unfailing tests as to their genuineness, and these, it is said, the X rays readily detect.

A superintendent of a trolley road down East was riding on a car which was struck by lightning. The fuse of the car lighting circuit was blown, and there were no spare fuses on board. The superintendent borrowed a hairpin from a woman passenger and improvised a temporary fuse. Now he is a great man.

An interesting coincidence of names has developed in the fact that Mr. Gardiner C. Sims, of Providence, R. I., who is chief engineer of the naval repair ship "Vulcan," is also treasurer of the Vulcan Foundry Company, of Pawtucket, R. I. While, of course, Mr. Sims had nothing to do with the christening of the ship, the use of the word "Vulcan" is especially appropriate in both instances.

Shortly before the late war with Spain commenced, the United States Government purchased from the Brazilian Government the cruiser "Amazonas" (now the "New Orleans"), then lying at Gravesend, Eng. A detachment of officers and men was detailed from the "San Francisco" to bring our new ship across the Atlantic to a United States port. One of these officers, in writing his experiences of the voyage, relates the following:



A VIEW ON THE CRIPPLE CREEK DISTRICT RAILROAD, CLAIMED TO BE THE HIGHEST ELECTRIC RAILROAD IN THE WORLD.

"As is the case in most British cruisers, no means of heating the living spaces had been provided, and on deck we were exposed to real Lunnon weather, drizzle and sleet by day and frost by night, and between decks everything was kept damp by the condensation of moisture on the steel of the ship. The only way to keep warm during the day was to keep moving, especially as we were accustomed to the fine weather of the Riviera. At dinner we gathered around the tables in regulation overcoats, with collars, and, out of respect to our surroundings, trousers turned up. It was at night, however, that the bravery of our fellows was shown, for it required rare courage to plunge into the cold beds, and rarer still to turn out. 'El Medico' saved lives and earned the good will of his messmates by discovering that a portable electric lamp was as good as a hot-water bottle. The 'Major,' who had two lamps, was considered the luckiest man aboard, as he enjoyed the unusual sensation of heat penetrating the soles of his feet and creeping up his spinal column at the same time."

Admiral P. H. Colomb, R. N., contributes to the October number of the *North American Review* a paper on "The United States Navy Under the New Conditions of National Life," wherein is forcibly shown how, upon the maintenance only of a predominant navy, will the recently acquired possessions of the United States become a source of additional strength and the power of enforcing her views among the nations of the earth.

The Santa Fé road has made arrangements to light all the cars of its limited trains running between Chicago and Los Angeles, a distance of 2,209 miles, with electricity. The electric equipment of each train will aggregate 4,928 candle-power. All berths will be provided with berth lights, and this will be the first train in the world carrying such a large supply of light service exclusively from the car axles. It is the intention also to light the locomotive headlight from the same service, thus making the four limited trains solid axle light trains throughout.

THE CRIPPLE CREEK DISTRICT RAILROAD.

THE ELECTRIC RAILWAY FROM CRIPPLE CREEK TO VICTOR, COLO., SAID TO BE THE HIGHEST IN THE WORLD.

The mining district in the vicinity of Cripple Creek, in Colorado, covers as rough and unpromising a region for railroad construction as can be imagined. The town of Cripple Creek, however, has been connected with the outside world for several years by two steam roads, and a third road, operated by electric motors, has recently been completed to Colorado Springs. In the mining district itself there are two other railroads, one a steam road from Victor to Altman, which claims to be the highest town in the world, and the other an overhead trolley line running from Cripple Creek to Victor. The latter is a part of the Colorado Springs electric line. All these railway lines derive a large and profitable traffic from the numerous mines in the vicinity.

The Cripple Creek District Railroad claims to be the highest electric railroad in the world. It passes over the mountain tops between Cripple Creek and Victor instead of running around the mountains as do the steam roads. In this way it reaches a part of the mining camps not touched by the steam roads, and thus secures a fine passenger traffic. The road was completed in December, 1897. The chief engineer was Mr. W. H. Leffingwell, of Cripple Creek, and the projector and general manager is Mr. L. D. Ross, of Colorado Springs.

The Cripple Creek District Railroad is six miles long, it being three miles each way from the station at Midway on the summit of Horseshoe Pass. There is about 1,000 feet rise from Cripple Creek to Midway at an altitude of 10,500 feet. On the southeast side the descent to Victor is about 700 feet. The highest grade on the road is seven and one-half per cent, which was put in near Cripple Creek to avoid interference with

some mining dumps. There are several grades of six and one-half and seven per cent.

Curves as sharp as 60 degrees, or about 100 feet radius, are used. The track is elevated one-half inch per degree of curve up to six inches. The grade is compensated on curves at the rate of 0.03; 60-pound rails are used. Three cars comprise the present rolling stock. These are each 40½ feet long and weigh, with motors, 19 tons. Two 57-horse-power motors are used, both at one end. In the vestibule is the controller, and also the air-brake compressor and appliances. The car has two four-wheel trucks, and three-inch tread wheels are now used, but are to be replaced by four-inch. A second hand Armington & Sims engine is at present used at the power station at Cripple Creek, and as it can work up to only 175 horse-power, only one car at a time can be drawn up the hill. Two are run regularly, one always descending. A six-pole dynamo is used, and the current goes out over the two-wire feeder line at 550 volts, reducing to 480 and 450 on the line, however. This feeder line runs directly across the country and is tapped where it crosses or comes near the track—about 10 times. The trolley wire is No. 00. The bonds for rail joints are No. 0000, No. 00 being found too light.

The cars have a seating capacity of 40, though 100 people are often carried at a load. Immediately on starting down hill the air pump is started going. Straight air is used, the pressure in the cylinder being kept at 70 to 80 pounds, while the average pressure applied is about 30 pounds. The steel brake-shoes used wear out in about three weeks. During the Winter when a snow-storm is in progress a car is kept running all the time to keep the track clear, the track scraper being used. We are indebted to the *Engineering News* for the preceding illustration and the accompanying data.

Black River Traction Company.

The report of the Black River, N. Y., Traction Company for the six months ended June 30 last shows: Gross earnings, $12,049; operating expenses, $9,556; net earnings, $2,493; other income, $238; gross income, $2,731; fixed charges, $1,222; net income, $1,509. The number of passengers carried during the half year was 262,723. The 27 employés of the company received $5,955 in wages and salaries. Three persons were injured.

The "Dedenda" Street-Car Gong.

The J. G. Brill Company, of Philadelphia, have recently made a great improvement in a small detail of car construction. It is a new and effective form of mechanism for carrying and striking the gong. The accompanying illustration shows the gong in position, with details of construction.

The gong mechanism is of an entirely new type. It possesses many advantages of its own. The working parts consist of a pedal and a hammer or clapper. The latter is weighted, so that it has a rebound after the blow has been delivered. The gong mechanism consists of but four pieces. These are the treadle, a malleable iron guide for it, which screws to the floor, a malleable frame for holding the hammer and the weighted hammer itself.

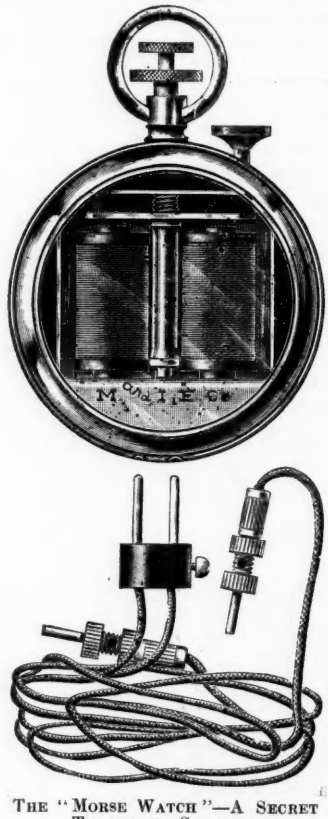
The "action" is one which produces a complete disconnection between the hammer and treadle during the last half inch of the hammer's travel. The blow is a clear, quick one, of what may be called a rebounding character. The weight on the hammer is four or five times the size of the hammer head, and while it adds its momentum to that of the hammer in striking the blow, yet as soon as the blow is delivered gravity takes it downward, bringing the hammer away from the gong.

Pains have been taken in the design to arrange the posts in such a way that the hammer can not be held against the bell by holding down the treadle. At its lowest point the treadle does not bring the hammer within half an inch of the gong, so that there is no danger nor possibility of producing a chatter either by design or accident.

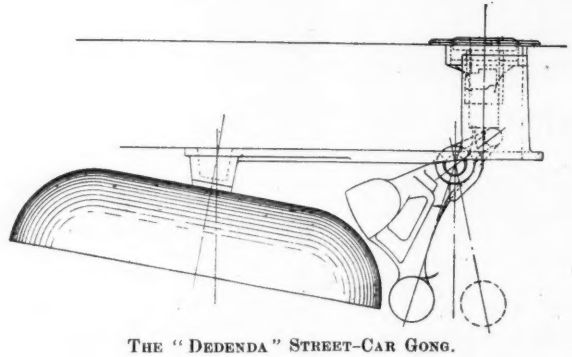
The sound is always clear, because at the moment the gong is struck the hammer is not connected with any point save the pivot, and it is instantly carried back out of contact by the falling of the weighted portion.

The plunger or treadle is a hollow cylinder with a large head. When the gong is not in use a half turn of the treadle-head locks it down flush with the floor, and at the same time leaves the hammer where it can not by any accident strike the gong. The plunger-head is recessed, so that it can be easily turned by the fingers. The platform surface is thus left flush without obstructions. There is no shifting of treadles and no danger of loss.

The whole arrangement is self-contained and can be put up by any carpenter. Two three-inch round holes are cut in the platform floor. The blocking pin upon which the gong and its frame is carried is two and three-quarter inches thick and fastens directly to the floor-boards. No cutting of the timbers or other parts of the platform is necessary. All the pieces are so shaped that they can not be assembled except in their proper positions.



THE "MORSE WATCH"—A SECRET TELEGRAPH SOUNDER.



THE "DEDENDA" STREET-CAR GONG.

A Novel and Attractive Secret Sounder.

The Manufacturers and Inventors' Electric Company, of this city, are manufacturing a novel and useful telegraph instrument which they call the "Morse Watch." It was invented by their firm, of which Mr. T J. Smith, formerly manager for the E. S. Greeley & Company, is the general manager. Mr. Smith is an experienced telegraph operator.

The name implies, to some extent, the functions and the form of the new instrument

It is a "Morse" telegraph instrument, a key and sounder, mounted in an ordinary pocket watch-case.

The special object is to attain a secret telegraph sounder, small in size, simple in mechanism, attractive in appearance and convenient for transportation, without sacrificing any of the practical operative qualities of the apparatus. The Morse watch, as made, is readily adjustable in sound from the loud click of the ordinary telegraph sounder down to an almost inaudible tick like that of a watch, requiring the instrument to be held in contact with the ear in order to read the signals. It is provided with a soft, flexible headband of mohair, with specially designed fastenings for attaching the watch to the head over the ear, for secret work or for work in locations so noisy that the sound of the ordinary sounder is drowned.

A silk conducting cord equipped with suitable terminals makes it possible to attach the watch to a telegraph line or remove it therefrom without loss of time.

In these days of modern telegraph methods, when most all high-speed telegraphers transcribe their work direct upon a typewriter, it becomes necessary to provide in some way to neutralize the noise of the latter machine, which otherwise would greatly interfere with reading the "Morse." This difficulty is effectually taken care of by the Morse watch, and secures to the operator all necessary immunity from the noise of the type writing machines. In brokers' offices, where secrecy of telegraphic transmission may be imperative, the Morse watch does the work in silence and defeats eavesdropping. The military telegraph can use this instrument in the tent or upon outpost duty without fear of being overheard by spies or betraying advance positions to the enemy.

The whole outfit of the Morse watch, including cords, headband and all, weighs only four and one half ounces, and can be carried in the vest pocket. The makers, the Manufacturers and Inventors' Electric Company, 96 and 98 Fulton street, New York, issue, free to all who request it, a circular giving a full description of the whole apparatus.

THE USE OF ELECTRICITY IN THE SPANISH-AMERICAN WAR.

ABSTRACT OF A PAPER READ BEFORE CHICAGO ELECTRICAL ASSOCIATION OCTOBER 7, 1898, BY THOS. G. GRIER.

The application of electricity in the army and navy for its various and many purposes is recent, but its progress is rapid. The object of this paper is more to note the uses than to describe the details.

The fortification board established 10 years ago by the United States Government has developed complete and elaborate plans for the equipment of coast fortifications.

In these plans electricity plays a very important part. Submarine mines connected by cable with harbor forts have been planted, electric light and power stations have been installed, searchlights, motors, telephones, telegraph instruments and many other devices have been used in preparing for the defense of our harbors.

Range-finders for determining distances were extensively used; these instruments may be dependent upon electricity for their operation, as in the case of the Fiske range-finder, or may be operated mechanically.

Just prior to our recent war with Spain, 200 Lewis depression range-finders were ordered by the United States Government to equip our various fortifications. While these instruments are operated mechanically, their efficiency in action depends upon the application of electricity in communicating the distance observed to the gun captain or commander.

To condense as much as possible, a brief summary of the applications can be given by describing the methods employed at Fort Wadsworth, which lies just below New York city. In this fort the fire commander directs the attack from a sheltered station equipped with a Lewis range-finder. There is also a position-finder station and four battery commander stations. The fire commander is in direct communication with all by means of telephones.

In the position finder's station, together with numerous other instruments, is a dial telegraph, electric clock and telephone. One of the guns is equipped with a dial telegraph and another with a Sheey teleotype, an instrument which indicates the azimuth or angle from a predetermined line and gives the range or distance in yards the observed vessel is from the fort.

All of the commanders' stations are, however, connected with the guns both by speaking-tubes and telephones.

Observations are signaled to the guns, and the course and speed of a ship are plotted upon a miniature representation of the harbor. By means of an electric clock placed at every station absolute uniformity of time is obtained, and the probable course and range of a vessel for several minutes can be plotted from these observations, and without even seeing the vessel the gun can be elevated for the range and trained for the proper angle, and by means of a stop watch the order to fire given so that the shot will fall upon the deck of a vessel whose course has been observed by men at a distance from the guns. The introduction of electricity for signaling has given this wonderful control to the fire commander over his batteries.

Sandy Hook, at the mouth of the harbor, is connected by cable with Fort Wadsworth, and the approach of hostile ships may be telegraphed to the fire commander, so that their course may be watched and the fort prepared at the proper time to do justice to the work before them.

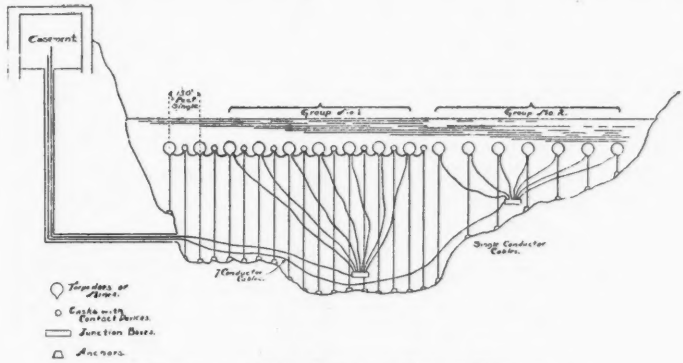


DIAGRAM OF MINE FIELDS IN BOSTON HARBOR.

Sandy Hook was placed in telephone communication also with Washington during this Summer, so that the government was in position to receive or send messages to the fortifications.

Fort Wadsworth has two 60,000-candle-power searchlights to sweep the harbor and guard against the approach of vessels on dark and stormy nights

An electric light and power plant forms a portion of the outfit with a reserve storage battery to supplement the power-station.

The mining of the harbors was an important part of our coast defenses, and the greatest demand for electrical wires and cables was for "torpedo cables" for use in submarine mines. It seems that our coast defense department has for years requested that an appropriation be made for cable, but the appropriations have been so cut down that not more than five per cent of the amount needed was carried on hand by the government. There are two styles of cables used, a multiple cable of seven conductors which is used to connect the shore end to a junction box in the channel, and a single-conductor cable which connects each conductor in the multiple cable to an independent mine, each conductor being numbered. Any mine may be exploded at will from the shore.

When war was declared each of the manufacturers of submarine cable in this country received orders for all they could make in 30 days, and some were kept busy for 60 days, producing probably 200 miles of multiple cable and 200 miles of the single-conductor. This has been distributed from the Bay of Fundy to Florida. Some was sent to the gulf cities and some to California, Oregon and Washington. One hundred and fifty miles of each size was under contract in the early part of August. The cost of seven-conductor cable averages about $1,900 per mile, and the single conductor about $450 per mile.

There are three different kinds of mines used in our harbor defense:

1. Observation mines, which are fired from shore when a ship is judged by observation, to be within effective range of the explosive.
2. Automatic mines, which are self-firing on being struck by a vessel.
3. Electrical contact mines, which, on being struck by a ship, give notice on shore, and the operator, by the throw of a switch, fires the mines.

The method of firing observation mines and electrical contact mines is similar. Automatic mines may or may not be fired by electrical means.

Mines may be placed upon the bottom of the harbor, and in such cases are called ground mines, and if they are contact mines the contact mechanism is contained in small buoys anchored at a depth below low-water mark, just sufficient for them to be an obstruction in the path of vessels. When the channel is deep, buoyant or floating mines are used. A buoyant mine is more effective, as it lies nearer the object of attack, and for an equal effect does not require as large a charge of explosive.

The shape and material of mines or mine cases are various, and the kinds employed at different points not always identical. However, a general description of the mines employed in Boston Harbor will give a good idea of the plan and design used in all other harbors.

There were about 1,000 mines planted in Boston Harbor, covering the main ship channel and ingress to the harbor where vessels of over 12-foot draft could go at low water. The regular government mine consists of an upright iron cylinder about the shape of a top, with a strap on the bottom for holding the cable. Galvanized steel rope, secured by an anchorage of any kind, and in many cases of old horse-car rails, maintained the mines in position. The cable containing the electric wires runs up separately from the cable holding down the mines.

As the demand was urgent and no mines of the government pattern were to be had, the engineers in Boston used new ale barrels, a hole being bored in one end for the receipt of the contact mechanism and cable. The barrels were encircled with rope to make a sling to hold them down, a flat steel ring put around the rope so that the steel anchor cable attached to it would not cut through. These mines were of different sizes and held from 100 to 500 pounds of explosive gelatin. Ordinary dynamite was used in some mines where there was not enough gelatin to be obtained. This was put in through a small hole in the top where the electric contact mechanism is placed.

The contact mechanism is connected through high resistance and by a battery circuit, using the cable and ground return for its conductors to an indicating and circuit-closing device located in the protected casemate on shore. When a ship strikes a mine containing the device, deflecting the mine from its normal position, the battery circuit is closed; this operates an indicating mechanism which closes a break in the dynamo circuit and notifies the operator. To throw on the current for exploding a mine, it is necessary to throw in a switch or plug after the first break is closed by the indicating device. This circuit can be closed without any contact from the vessel at the will of the officer in the casemate.

The firing switchboards at Boston consisted of an ordinary knife-switch suitable to take 500 volts, with a spring which holds it out of contact at all times except when kept in position by the operator. These switches, one for every group of mines, were mounted on slate boards and plainly numbered with large letters. A dynamo developing one ampere at 500 volts, driven by an oil engine, furnished the exploding current. All of the parts of the contacting mechanism were of platinum or gold-plated brass to prevent any possibility of corrosion. The exploder consisted of a thin strip of platinum wire which was laid in a case of fulminate, which in turn was put in a case of dry guncotton; the remainder of the explosive was wet.

The mines were usually placed in groups of seven each, about 150 feet apart. These groups of mines in Boston Harbor were strung clear across the channel, and in the main channel there were three lines.

In this method, should a vessel be sunk by the first line of mines and the wreck not obstruct the passage for other vessels, the second line of mines would catch the next vessel and the third line the third vessel. Between the mines were small casks with contacting devices connected to mines on either side. These were cheaper than mines, but were equally serviceable and made the line complete, so that no vessel could get through.

FOREIGN ELECTRICAL NEWS.

Electricity as a Water Purifier—The purification of water by means of electricity has just been tried, says the *Zeitschrift für Beleuchtungswesen*, with remarkable success at Blankenberghe in Belgium. The water is filtered and ozoned by means of the Baron Tyndal system, which is shortly to be tried on the waters of the Seine at Lemaur, near Paris. The water at Blankenberghe is drawn from the Burges Canal, at a spot called Schoorebrugghe, and is carried by natural means into a cesspool. Here a rotating pump sucks the water into a large reservoir, whence it is again diverted into two cylinders worked by means of a "balloon valve." From these cylinders it flows into three filtering troughs, after having been first disinfected by a solution of phenic acid, placed in a leaden reservoir, which is supplied with an indicator showing the number of drops to be mixed with every cubic metre of water. The filtering matter contained in these troughs, which are equipped with six pipes, 0.10 metres in diameter, is composed as follows:

Fine gravel	0.10 metres.
Sand	0.10 "
Coarse gravel	0.15 "
Sand	0.10 "
Charcoal	0.35 "
Sand (of a very fine quality)	0.10 "
Total	0.90 "

In each trough is a pipe for leading off the salt water used in a daily cleansing of the filters, this water being poured into the sewer. After being subjected to this process of filtration, the water to be distributed is made to flow into a second reservoir, whence it is drawn by means of a centrifugal pump that carries it to the "sterilizators," or electrical machines, of a tension of 1,000 volts, after leaving which it is distributed to the inhabitants of Blankenberghe, pure and palatable. The output of the supply is said to average 1,000 cubic metres a day, and in Winter from 250 to 300 cubic metres daily.

Improvements in the Production of Ozone—The production of ozone has hitherto been limited to 10 or 12 grams per electric horse-power, although in theory it has been claimed that as much as one kilo may be produced. M. Andreoli, who has long been interested in the matter, now claims that he is able to increase the amount to 40 and in some cases even to 50 grams per horse-power. This result he has obtained by improvements effected in the apparatus used in the production of ozone. The cost he asserts to be about 80 cents per kilo. The importance of this contention, if reliable, is obvious. M. Andreoli is at present engaged in carrying out extensive experiments of his improved apparatus, in order to ascertain the value of the process in commercial affairs.—*Zeitschrift für Electrochemie.*

Electricity in the Valley of St. Gothard—Much of the popularity of Switzerland as a tourist resort is attributable to the innumerable cascades and torrents with which it abounds. These waterfalls are possessed, however, of another value than that of mere picturesqueness; their utility for electrical purposes has lately been widely demonstrated. They now furnish electric power and light to almost every village in the country. One of the most picturesque of these villages is Gurtnellen in the famous valley of St. Gothard. Here a Zurichian company, the Granitverk Gurtnellen, is engaged in working a granite quarry, and the presence of a waterfall in the neighborhood suggested to them the idea of utilizing the waters for the production of electricity in connection with the works. An Escher-Wyos turbine of 200 horse-power was accordingly installed, along with a Brown-Boveri dynamo of 75 horse-power, working under a tension of 110 volts. The current thus installed is used to light the quarry, the adjoining offices and even the furnaces, thanks to radiators installed in suitable positions. In addition to this, motive power is represented by three motors, two of six horse-power each, used in working the crane employed in raising the blocks of granite to the surface, and another of 45 horse-power which serves the purpose of imparting electric energy to the sawing machines. These saws, which are of the Brunton, London, make, are composed of an endless chain of very large surface, carrying three circular knives or saws, each of about 0.03 metres in diameter, which are brought successively in contact with the blocks of granite into which they cut with astonishing ease. The installations, which are only in their initiatory stage, are under the supervision of a former member of the firm of Brown & Boveri.—*L'Electricien.*

Cost of Cooking with Electricity—A writer in *Elecktrotechnischer Anzeiger* has been at much pains to dispel the popular belief that cooking by means of electricity is far more costly than preparing the daily meals by any other process. All good housewives are aware of the incontestable advantages in favor of the former system, both as regards cleanliness and the lessening of labor; and the majority would be willing to adopt it but for fear of the cost to be incurred. The outlay necessary for obtaining the requisite apparatus, as well as the price of the "mysterious agent" in question, is largely responsible for the lack of appreciation shown for this method of cooking. In order to dispel these false ideas, the writer, who

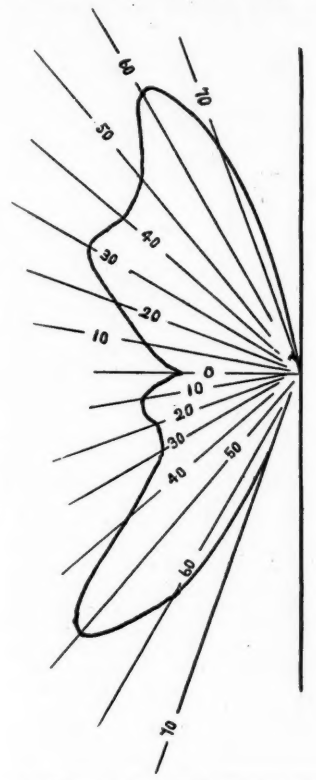


FIG. 4.—DISTRIBUTION OF INTENSITY FROM OPEN ALTERNATING ARC. (UPPENBORN.)

hails from Frankfort, has made a careful calculation whereby he shows just how much, to the fraction of a penny, a meal for four persons would cost. Assuming that the current was paid for at the rate of four cents per kilowatt-hour, the following tariffs were arrived at:

Dishes.	Amperes consumed.	Minutes.	Cost. Cents.
Cooking three pounds of beef	8.7	20	1½
Keeping beef warm	2.6	154	2½
Cooking of cabbage	8.8	22	1½
Putting same in oven	8.8	20	1½
Egg sauce for cabbage	0.6	1	½
Keeping dish warm	3.1	14	1
Apple fritters, with butter	5	25	3
Needless warming of sauce-pans	5.5	5	1

Showing that for the modest sum of eight cents a dinner sufficient for two persons can be cooked. For six persons only seven cents' worth of current would be employed, and the washing up of the plates, etc., in 11.35 litres of warm water, would cost in the neighborhood of only one cent. The daily expenditures, at this rate, for a family of four persons, eating three meals a day, would be about 12 cents.

The following is the tariff which the executive committee in charge of the electric installations in connection with the forthcoming exhibition in Paris in 1900 has decided upon for the compensation of the electrical exhibitors, who, according to arrangements, are to install the electric apparatus to be used in lighting the buildings (see this page in former issue of the REVIEW):

	Steam machines.	Dynamos.	Total.
	Francs.	Francs.	Francs.
1. For less than 1,000 horse-power	9.95	4.08	14.03
2. 1,000 to 1,500 horse-power	7.10	1.25	8.35
3. Above 1,500 horse-power	5.20	0.95	6.15
Total maximum contribution	240,000	100.000	340,000
One-half of which for the French section	120,000	50,000	170.000
The other half for all foreign sections	120,000	50,000	170,000

Electric Signaling on Trains—A native of Prague, named John Sauk, has invented an electric apparatus by which two trains may communicate with each other in passing, and, after a series of careful tests, this apparatus has received the approval of a body of specialists. An electric sounder is fixed on the locomotive, and when another train is on the same line the sounder gives the alarm automatically. The cost of the installation is insignificant. Mr. Sauk, however, can not claim originality for his invention for, as previously announced, Mr. Alexander Lefevre, of Heyst-of den-Berg, has tried the attempt of signaling in this manner on board a train in Belgium. The latter apparatus was composed of a magneto-electric sounder fixed to the locomotive and worked by one of the axles; two conductors were placed near the rails and a telephone attached, the whole working when two locomotives approached each other. This system has been further modified by M. Jules Buse, Jr.—*L'Electricien.*

The Final Effort Wins.

The last stroke fells the tree. All the others have aided, but without the last there would have been no result. Nine advertisements may all but fell the tree of public skepticism, while the tenth will complete the work. If the advertiser becomes discouraged just before the tenth, the nine will count for nothing.—*Printers' Ink.*

THE PHOTOMETRY OF THE ENCLOSED ALTERNATING ARC.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NEW YORK, SEPTEMBER 28, 1898, BY CHARLES P. MATTHEWS, W. H. THOMPSON AND J. E. HILBISH.

(Continued from page 215.)

A number of enclosed arc lamps, in their commercial form, were kindly placed at the disposal of the writers by their respective manufacturers. As this paper has no other object than to exhibit such features of the performance of these lamps as are largely typical, the trade names of the lamps are withheld.

For each position of the arc, no fewer than 44 photometric settings were recorded. It was found that this number was sufficient to include the maximum and minimum values and a sufficient number of intermediate values to give a mean that could be reproduced quite closely at different times, thus showing the reliability of the method.

Lamp A—The distribution of intensity from this lamp is shown in the polar diagram of Fig. 3; the figures for the curve are as follows:

TABLE II.

Angle.	Intensity.
0° horizontal	121.4 H. U.
10° above	169.0
20° "	155.0
30° "	189.0
40° "	176.0
50° "	46.5
60° "	22.4
10° below	164.5
20° "	134.7
30° "	167.4
40° "	187.5
50° "	203.0
60° "	130.5
70° "	82.6
80° "	64.0

The following is a summary of the results of the test of this lamp:

TABLE III.

Volts	103.2
Amperes	5.84
Apparent watts	602
True watts	407
Watts in mechanism	80
Power factor	0.67
Maximum intensity	203
Direction of maximum intensity	below 50°
" " " "	above 30°
Mean hemispherical intensity:	
Upper hemisphere	91.8
Lower hemisphere	127.1
Mean spherical intensity	110.5
Watts per mean spherical Hefner unit	3.68
Watts in arc per mean spherical Hefner unit	2.96
Watts in arc	327
Globes, character of	opalescent inner.
Carbons	½-inch "Electra."

The lamp was intended for an electro-motive force of 104 volts, and the attempt was made to keep it at this pressure, but at the close of the test the average electro-motive force proved to be 103.2. The power factor is due to the inductance of the mechanism, as it has been clearly established by Blondel* that, in the arc itself, the electro-motive force and current are strictly in phase. It is easy to confirm this fact by current, pressure and power readings taken with reference to the arc alone.

The upper and lower lobes of the distribution curve do not yield quite the same mean values. The discrepancy is due, no doubt, partly to the fact that the bulb about the arc is not of symmetrical curvature, and partly to the greater reflection from the parts of the lamp situated just above the arc. The shape of the distribution curve alters somewhat as the burning of the carbons progresses. The general shape of the curve is not far from that which has been obtained for the open arc. For comparison, one of the several curves taken by Uppenborn† for the open arc is here shown (Fig. 4). In the enclosed arc the lobes of the distribution curve are shorter, blunter and extend outward at smaller angles with the horizontal. These changes are due to the shape of the carbon points. It may be pointed out that the distribution curve as plotted above is a half-section of the mean photometric surface, which is a surface of revolution. The actual photometric surface—so far from being a surface of revolution—is continually swelling, contracting and twisting in a marvelous fashion. As to whether the light thrown upward is of value will depend on whether the light is suspended in the open air or under a reflecting ceiling. In most cases considerable benefit will be obtained by the use of a reflector, as is illustrated in the following figure:

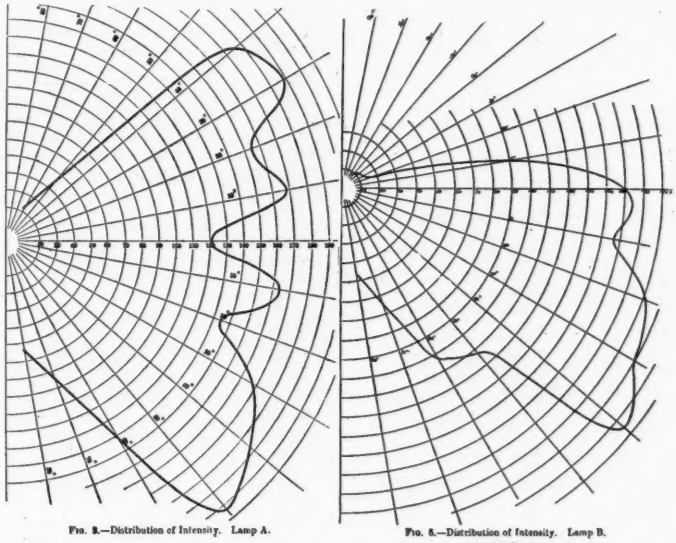


FIG. 3.—Distribution of Intensity. Lamp A.

FIG. 5.—Distribution of Intensity. Lamp B.

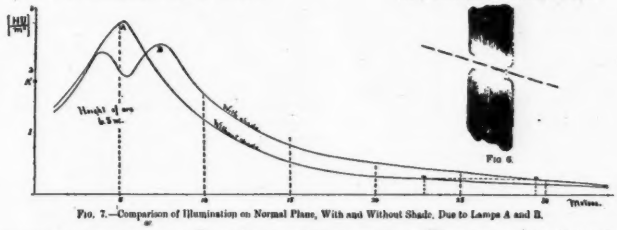


FIG. 7.—Comparison of Illumination on Normal Plane, With and Without Shade, Due to Lamps A and B.

FIG 6.

DIAGRAMS ILLUSTRATING "THE PHOTOMETRY OF THE ENCLOSED ALTERNATING ARC."

Lamp B—This lamp was provided with a bell-shaped reflector of milky glass. The effect of the reflector on the distribution curve is very noticeable, the upper lobe being largely removed (Fig. 5). The minimum corresponding to the horizontal is displaced downward by about 10 degrees. This peculiarity can not be ascribed to the presence of the shade, as it was found in one or two cases where the lamps were fitted with inner globes only. It is quite surely due to the fact that the carbons so burn that the planes of their ends, although parallel, are rarely normal to their axes. Thus, in the case illustrated in Fig. 6, the minimum intensity might be found displaced either above or below the horizontal, according to the point of view.

TABLE IV.

Angle. Degrees.	Intensity. H. U.
0 horizontal	150.0
10 above	90.3
20 "	18.4
30 "	12.3
40 "	11.5
50 "	9.8
60 "	8.4
10 below	146.5
20 "	171.5
30 "	180.0
40 "	196.0
50 "	112.0
60 "	102.7
70 "	65.4
80 "	46.5

That the effect of the shade is distinctly advantageous will be further evident if curves of illumination be considered. And here unfortunately we must resort to an approximation. Data were taken for an exact determination of the effect of the shade on lamp B, but owing to an accident the figures are not now available. However, certain assumptions permit us to draw a comparison in the following way: Let

Ia = mean intensity of B above the horizontal and without shade.

Ib = mean intensity of B below the horizontal and without shade.

Ia' and Ib' be similar quantities as found for B with shade.

I' = mean intensity of A below horizontal.

Let it be further assumed that 30 per cent of Ia is absorbed by the shade. Now since the altered distribution from B is due wholly to the shade—the light incident upon the shade being partially reflected, partially transmitted and partially absorbed—we have, if $Ia = Ib$,

$$Ib = \frac{Ia' + Ib' + .31b}{2},$$

$$= \frac{Ia' + Ib'}{1.7} = 112.2,$$

which is the mean hemispherical intensity of lamp B without shade. If now the radii-vectors of the curve B are multiplied by the ratio $I' : Ib$, we shall have the effect of putting the shade on lamp A.

In plotting the illumination curves shown in Fig. 7, this last was done. Some difference of opinion exists as to whether the ordinates of a curve‡ like this should be the illumination on a surface normal to the ray or on a horizontal plane. In Fig. 7, the illumination on the normal plane has been used, as this quantity serves very well for the purpose of a comparison. It will be noted that the benefit resulting from the use of the shade is most marked at distances remote from the lamp, which is as it should be, since there is no lack of light in the vicinity of the lamp. The following table gives distances at which an equality of illumination will be found:

Unit of normal illumination.	Without shade. Metres.	With shade. Metres.
2.25	6.5	8.2
2.00	7.1	8.8
1.75	7.8	9.5
1.50	8.7	10.4
1.25	9.7	11.7
1.00	11.0	13.2
.75	12.7	15.5
.50	15.2	21.0
.25	22.9	29.4

(To be continued.)

Where the Name Came From.

[From the Syracuse, N. Y., Herald.]

Willie—Pa.

Pa—Well?

Willie—Would you call the ELECTRICAL REVIEW current literature?

* Blondel, *La Lumiere Electrique*, vol. 41, 1892.

† See Palaz, "Photométrie Industrielle," or translation by Patterson.

‡ It is probable that the unit of illumination most consistent with the C. G. S. system is $HU/cm.^2$. This unit is many times too large, however, and throws the numerical expression for an illumination far into the decimal places. The unit $HU/m.^2$, obtained by multiplying the first named unit by 10^{-4}, is preferable in this respect.

Electrical Review

[OLDEST ELECTRICAL WEEKLY IN THE UNITED STATES.]

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SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.
NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

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When 1898 closes, the record of electrical development in New York city will be seen to be a remarkable one. In the three important fields of telephony, traction and electric lighting wonderful progress has been made, and the end is not yet.

A daily newspaper says that a little girl was recently cured of asthma in St. Louis "by the application of static electricity applied in spray form through wooden electrodes." Will wonders never cease?

Out in Cincinnati a discussion is on as to whether or not guard rails on street cars are necessary to prevent passengers from alighting on the wrong side of the car. There is but one side to the question—hence argument is futile. By all means, guard rails should be used on open cars and guard gates on closed cars. The reasons are obvious.

The recent war developed, as nothing else could, the advantages and defects of electrical apparatus designed for use on shipboard and for military operations in the field. It is encouraging to note that a number of electrical inventors and experts are already at work attempting to overcome many of these defects and to increase the advantages. Progress in this direction may be expected.

James Creelman cables from Madrid, on the highest possible authority, that, with the exception of Senator Gray, the American peace commissioners are now heartily in favor of extending American sovereignty over the whole of the Philippines. He says the American commissioners are also unanimous that the United States shall neither assume, guarantee nor recognize in any manner the public debt of Cuba. We trust this forecast of the final result is true. It ought to be made true, if only for industrial reasons.

THE PROPER USE OF THE TELEPHONE.

We publish below an article which appeared recently in our esteemed daily contemporary, the New York *Tribune*, and we have no doubt a great many thousand of our readers who are subscribers to the telephone service will appreciate the point made by Mr. Du Val, who, as secretary to Hon. Chauncey M. Depew, is the possessor of one of the busiest telephones in New York city. We think it should be a well understood fact that the party originating the call should be at his end of the telephone line to meet the party whom he has requested to answer. The article is as follows:

There are various organizations in this city for the prevention of one thing or another. Some of them have fine buildings for offices and a wide scope for work, yet so far as is known, one of the greatest and most flagrant nuisances extant is permitted to flourish untrammelled, with only now and then a muttered protest. A campaign against this nuisance is about to be begun. All that has been wanting is a leader, and now he has appeared. The champion of the new cause is Horace C. Du Val. It is beyond any doubt a truth to say that when he takes the field and starts his campaign he will gather around him a loyal army of tremendous influence.

The nuisance Mr. Du Val has decided to annihilate is the "hold-the-wire" fiend. Every busy man knows what that means. How often has a man whose every moment is valuable had the telephone bell in his office jingle. When it is answered by the office boy the query will come, "Is this Mr. So-and-So's office?" Then, "Is he there?" Then, upon receiving an answer, the request, "Will you tell him he is wanted by —— ?" Then the busy man steps to the telephone and is greeted with, "Is this Mr. —— ?" When he says it is, there comes back the heart-breaking answer, "Hold the wire a minute."

Mr. Du Val has suffered acutely with this trouble. He has adopted a system of his own, and in many of the most flagrant cases has succeeded in reforming the offender. His method is as follows: When the bell tingles and he is asked for, he steps to the telephone and this is the conversation:

"Hello."

"Yes, this is Du Val; who wants me?"

"Mr. Du Val? Yes. Hold the wire"——

So soon as he hears the word "hold" he drops the receiver like a hot cake and walks off. Then comes a furious ringing, and he goes back to the telephone to hear:

"Hello. Hello. Is this Mr. Du Val?"

"Yes."

"Well, some one cut us off. Hold the" ——

Here the receiver is dropped again, and then in a minute another furious ring. This time it is likely to be the man himself, and then the conversation goes on all right. A few doses of this severe treatment have proved exceptionally beneficial. Mr. Du Val thinks every busy man ought to join his organization and make a personal campaign. He thinks in this way the trouble can be greatly allayed, if not absolutely cured.

A DECISION ON STREET RAILWAY TRANSFERS.

Street railways which issue transfer tickets are obliged to accept them even if the time limit has expired, providing the person holding the ticket has been unable to secure a seat in a car before the time specified has passed, is the decision of the Supreme Court in a case decided at Brooklyn, N. Y., last week. This decision was rendered in the case of John Jenkins, who brought an action against the Brooklyn Heights Railroad Company to recover damages because a conductor refused to accept a transfer ticket and then put him off the car and had him arrested for causing a disturbance.

On December 14, 1895, Jenkins received a transfer ticket from a conductor on a Montague street car to the Fulton street line. Several cars passed, but each was crowded with passengers and Jenkins did not get on. When a car came along in which there was seating room he boarded it and rode for several blocks. The conductor refused to accept the transfer ticket on the ground that the time limit had passed. Jenkins refused to pay another fare or to leave the car until a policeman was called and he was arrested. On making a statement of the case at the station house he was discharged.

He brought an action in the Supreme Court, and a decision was rendered in favor of the railroad. He appealed from the decision, and Justice Woodward, of the Appellate Division, ordered a new trial, declaring in his opinion that the railroad company was obliged to accept the transfer ticket even if the time limit had expired, providing the cars were so crowded that a seat could not be furnished. The second trial, just ended, resulted in a verdict for the complainant, who was awarded $400 damages.

WALL STREET AND THE ELECTRICAL STOCK MARKET.

The movement of prices in the stock market during the week was slow and limited, except in the case of several industrial stocks. The outlook is generally satisfactory, but the sales were smaller than the preceding week.

On the New York exchange, General Electric closed the week at 80¼ bid and 80½ asked, a net gain for the week of 1⅛ points. Edison Illuminating of New York closed at 119 bid and 124 asked, a net decline of 11 points for the week. On the Boston exchange, American Bell Telephone closed at 280 bid and 281 asked. Erie Telephone closed at 74¼ bid and 75 asked. On the Philadelphia exchange, Electric Storage Battery closed at 38¼ bid and 39 asked.

The instrument statement of the American Bell Telephone Company for the month ended September 20 shows:

	1898.	1897.	1896.
Gross output.....	31,977	19,198	12,042
Returned.....	12,931	7,105	7,030
Net output.....	19,046	12,093	5,012
Since December 20:			
Gross output.....	344,734	162,743	148,395
Returned.....	108,259	69,109	68,547
Net output.....	136,465	93,637	79,848
Total.....	1,055,586	867,486	756,384

Wall Street, October 8.

A Big Light and Power Company Organized.

The New York Gas, Electric Light, Heat and Power Company, with a capital of $25,000,000, was incorporated last week, and the organization tax of $31,250 was paid to the State Treasurer. The incorporators are a number of young lawyers, by name Henry J. Hemmens, Frank D. Allen, Frederick L. Allen, J. Frank Yawger, Louis M. King, Charles N. Flint and Nathaniel W. Smith, all of New York city.

The filing of the papers of this company has created considerable local interest, and the daily press has connected it with the consolidation of the Brooklyn lighting interests, in which Anthony N. Brady, Hon. Roswell P. Flower, A. M. Young, W. F. Sheehan and George Foster Peabody are known to have figured. There is also a persistent rumor that the Metropolitan Street Railway Company is identified with the new company and that the conduits that are now being laid on Broadway for the underground electric railway to replace the cable on that thoroughfare are to be used for electric wires for light and power purposes by this new company. There was also an effort to connect the proposed electrical equipment of the Manhattan Elevated Railway with the new company. Another rumor was to the effect that the company was incorporated to consolidate the Brooklyn electrical interests, both for light and traction purposes. For the present, whoever is back of the new company, with its millions of capital, have succeeded in keeping the purpose of its organization well concealed.

PERSONAL.

Mr. W. J. Clark, general manager of the General Electric Company's railway department, has gone to Havana.

Mr. John A. Brill, of the J. G. Brill Company, Philadelphia, visited New York city last week and reports great activity in the car building branch of the industry.

Mr. George C. Maynard, of Washington, D. C., visited New York city last week on a mission for the Smithsonian Institution. Mr. Maynard is endeavoring to add to the institution's collection of historical electrical apparatus.

Col. Eugene Griffin, of the First Regiment of Volunteer Engineers, who recently returned from Porto Rico to his home at Ardsley, N. Y., suffering with fever, had a relapse last week which will prevent his rejoining his command for two weeks more.

Another New York Central Station Reduces Prices.

Following the action of the Edison Electric Illuminating Company of New York, noted in the ELECTRICAL REVIEW last week, in reducing the price of electric current to its customers, the United Electric Light and Power Company, of New York, on October 3, notified its patrons that a new schedule of lower rates would soon be sent out, to take effect from October 1. It says:

"All bills for current supplied on and after October 1 will be rendered at the new rates, a schedule of which will be sent you prior to the rendering of October accounts.

"Your special attention is called to our power service, which, owing to the use of Tesla induction motors without commutators and other complicated devices, is vastly superior to any other power service offered.

"We are giving the matter of the introduction of power apparatus special attention, and are prepared to make our rates of power service especially attractive."

LITERARY.

"The Negro as a Soldier" is the title of a two-page article in the issue of *Collier's Weekly* for October 8. There are half a dozen pictures of the negro troops in various situations, and the whole subject is treated in a manner worthy of peculiar interest.

Purdue University, Lafayette, Ind., has published in pamphlet form, with illustrations, the address recently delivered before the students of the engineering departments on "The Development of the Central Station," by Mr. Samuel Insull, president of the Chicago Edison company.

Prof. Dugald C. Jackson, of the University of Wisconsin, at Madison, has issued a circular giving information of the university's department of electrical engineering, of which he is the head. The circular gives a list of students from the six classes already graduated, and tells what positions they now occupy.

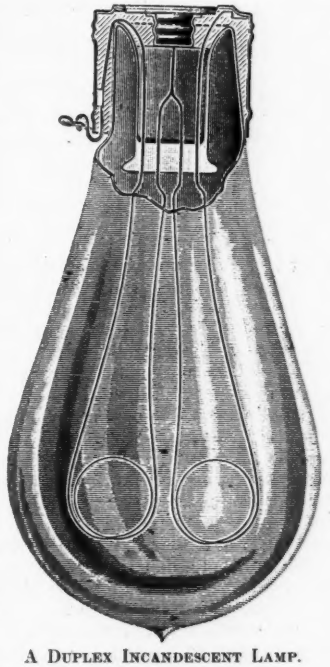
American Electrical Maintenance Company in Receivers' Hands

The American Electrical Maintenance Company, of 451 Greenwich street, New York city, on October 4, went into the hands of Alfred K. Warren and Francis Higgins, receivers, appointed by Justice Smyth in proceedings brought by the directors for the voluntary dissolution of the corporation, on the ground of insolvency. The liabilities are $35,199; nominal assets, $29,126; actual assets, $17,398 The Tradesmen's Bank is a creditor for $6,000.

DETROIT'S MUNICIPAL ELECTRIC LIGHTING PLANT.

ABSTRACT OF THE REPORT OF THE PUBLIC LIGHTING COMMISSION FOR THE YEAR ENDED JUNE 30, 1898.

The fiscal year just closed is the first in which a municipal lighting plant of any size has had as near a thorough test as possible, and the results are awaited by those interested for and against an institution of its kind. The physical results—that is, the conversion of fuel and water into electric current—for the year will bear comparison with the results of any plant, commercial or otherwise generating electricity. The results



A DUPLEX INCANDESCENT LAMP.

from labor will not compare as favorably, for the reason that slightly higher wages are paid and much shorter hours of work obligatory. The commission considered that the plant, operated under its enforced conditions, should produce an arc light of 2,000 candle-power at $50 yearly, and the heads of departments were instructed accordingly. By these economies the commission was able to reduce the cash outlay per lamp from $64.19 per annum for a monthly average of 1,564 lamps for the preceding year, to $51.85 per annum for a monthly average of 1,744 lamps. The reduction was largely in the item of labor, being reduced from $43.57 per lamp to $33.27 per lamp, while the reduction in the cost of supplies was from $20.62 to $18.58 per lamp.

While it is possible that improvements in some machinery may be made soon, which would cause a partial loss to the city of the value of part of its investment in machinery, on the other hand it is only fair to state that there is an equal probability of compensating improvements in other devices, and which will enable the city to further reduce the cost per lamp per year. The ultimate success of the plan of municipal ownership of a public lighting plant, viewed from the standpoint of economy to the taxpayer, can not as yet be claimed to be assured in the city of Detroit. Time is an essential element of consideration in arriving at a judgment at all valuable upon this question. The margin of profit per lamp at the present time, while it is not large, nevertheless is a showing to the advantage of the city, which, it is to be hoped, will be maintained or increased in the future. It is but just to observe in this connection that the quality of light furnished has been uniformly of the full standard of 2,000 candle-power, which is better than was found practicable to obtain of contractors; and also that collateral advantages not easily reducible to terms of pecuniary value have accrued to the city by reason of its operation of its own lighting plant. The results, such as they are, have been secured by the commission only by the practice of the strictest economy and the rigid exclusion of all those elements so apt to intrude into the administration of public municipal affairs, and which operate only to confound business principles and political expediency in perplexing entanglement. It has not been at all times easy to persuade some that these two policies occasionally clash irreconcilably, and in the determination of the one or the other, to be followed, it was the duty of the commission to be guided solely by the interest of the taxpayer. — *Public Opinion.*

A Duplex Incandescent Lamp.

The Fostoria Incandescent Lamp Company, manufacturers of the duplex incandescent lamp illustrated herewith, make these claims for the lamp: First, that if burned at ordinary candle-power, using each filament separately, it will last as long again as any lamp on the market; secondly, that by the use of the incorporated switch, the candle-power of the lamp can be doubled at will and turned back to normal candle-power at the will of the user; thirdly, that, both price and efficiency considered, it is the most economical and practicable lamp yet brought out, and fourthly, that it can be used in all standard bases without any change, expense or inconvenience.

RAILS—THEIR CONSTRUCTION FROM A SCIENTIFIC STANDPOINT.

READ BEFORE THE STREET RAILWAY ASSOCIATION OF THE STATE OF NEW YORK, MANHATTAN BEACH, SEPTEMBER 14, 1898, BY A. J. MOXHAM.

(Concluded from page 210.)

In the physical tests we will take first:

A. Specific Gravity (see Table I)—It will be noted that the West End rails show a specific gravity of 7.825, the hard rails 7.841 and the soft rails 7.855. But in considering specific gravity, it had best be based upon the iron alone in the composition. It is well known that the other chemical ingredients affect the net result almost imperceptibly in the matter of weight, but very greatly affect density of the iron—which is the bulk of the composition—in the matter of its physical property. It will be found a law that, where specific gravity is referred arbitrarily to the iron and the metalloids are ignored, or rather deducted, the specific gravity will tally closely with what is to be expected from the actual use of the metal. For instance, in this case, ignoring the metalloids, the specific gravity of the iron in the different rails will stand as follows:

Soft rail	.7956
Hard rail	.7971
West End rail	.7977

It is interesting to note the very close relations of this arbitrary specific gravity to the relative wear as shown in the test. This is not a point to be ignored, because it is an exponent of the mechanical treatment, and it explains consistently in this, as in many other cases, why the material with apparently (but not really) the lightest specific gravity will show the best results in use. The analysis shows that what is needed, as may be expected, is the densest steel.

Taking now B, Tension and Compression Tests. In the tension tests the ultimate strength stood as follows:

Soft rail	75,860 pounds.
Hard rail	118,100 pounds.
West End rail	120,380 pounds.

Closely following the determined wear. In elastic limit the relation is:

Soft rail	45,730 pounds.
Hard rail	62,500 pounds.
West End rail	53,160 pounds.

This it will be noted does not follow the rule of wear, and in this is a lesson, the indication being that, having secured a given amount of hardness, and consequently of strength, the more ductile the rail the better the wear. In the compression tests the same lesson is learned; the elastic limit of compression standing at:

Soft rail	35,000
Hard rail	50,300
West End rail	47,100

At a glance it would appear that the rail compressed the least would wear the longest, but where difference in compression is indicative of greater elasticity without a sacrifice of ultimate strength, it is within reason to the good.

We will deal now with chemical composition, comparing first the soft and hard rails.

As stated before, the only variation in chemical composition which we need look at in this comparison is the carbon, for, while there is a slight variation between the two silicons in the given rails, the total percentage of silicon in either is not a factor, and can therefore be ignored. The greater durability of the hard rail, as compared with the soft rail, speaks for the higher carbon, and it may here be noted that, so far as the higher carbon is concerned, it involves no higher cost to the street railway men.

On comparison the carbon of the West End rail is practically the same as that of the hard rail, silicon considerably higher; but the real point of difference between the hard rail and the West End rail lies in the lower phosphorous and higher manganese. It is well known that the low phosphorous, accompanied by an increasing manganese, conduces to greater ductility. On this point, however, a word of caution is necessary. Any decrease of phosphorous from what is known as standard in Bessemer steel, viz. .10, can only be achieved at a greatly increased cost of manufacture, and, therefore, so far as the chemical constituents of the rail are concerned, the whole problem to the street railroad man is how far it is economical to go in lower phosphorous, the other hardening elements remaining the same. A steel such as represented by the West End rail, or even a steel still lower in phosphorous, it is possible to make; it is purely a question of cost. On to-day's basis an extra cost of $1.50 per ton on the low phosphorous steel is a low estimate; it would be safer to take it at $2. Taking the average price of girder rails at, we will say, $25, the extra cost of the low phosphorous would be eight per cent. What would be the increased wear of the rails?

The average monthly wear of the hard rail is	.0012
The average monthly wear of the West End rail is	.0007

On the face of it it would appear, therefore, that those who could afford it were amply justified in demanding and purchasing the low phosphorous steel, but there is a hope for those who can not afford it; and there is some doubt, after all, as to the advantages to be gained from so doing, which, to my mind, brings us to the real lesson of the whole experiment. Pay close attention to what follows: We all know that we can use a street rail until at least one-half inch is worn away from the head, or .5 inch. On this basis, and taking the average wear of the different rails as shown in the test, it would take 25 years to wear away one-half inch with the soft rail; 35 years to wear away one-half inch with the hard rail; 60 years to wear away one-half inch with the West End rail; and this is the case of a road which represents not average, but excessive, wear, the rails in question having borne the wear of heavily loaded cars running on an average of 580 per hour for 20 hours per day, during the time of the experiments, or a two-minute headway. This means during the busy part of the day less than one-half minute headway, and during the night hours a wider interval. Taking the ordinary line, its average headway is less than this; consequently the theoretical wear would be greater. Now, all of us who are interested in electric roads, and have used girder rails, are aware of the fact that we do not get anything like this wear, and this being the case we have got to look to something else besides quality of steel. I think we all know what the cause is, and I am glad to again emphasize it because it discloses a great evil we are still suffering from without realizing it to the extent we should—the defect is in the joints.

Had these measurements of wear been taken at the joints instead of elsewhere, the lesson would have been different. Rails are taken out of the track to-day, not because the rail as a whole has reached the point of destruction, but because the joints have become too bad for further use. It must be remembered that the experiments in question have not been extended long enough to show the effects upon the rail of the degeneration of the joints. On the wear at the joints reaching a certain point, the wear of the rail increases rapidly. For instance, in the soft rail the average monthly wear being .0017 during the time of this experiment, in seven or eight years from this date the wear will have continued to go on at a constantly increasing ratio, starting from the point of defect at the joint.

In the early days of girder rails, the joint question was before us all. It was self evident, in that the earlier construction was so light that the joints quickly went to pieces. During later years, using a heavier rail and larger and better fitting splice-bars, we have heard less of this joint question, for, as compared with the earlier joints, the track is comparatively smooth. Nevertheless, the evil still exists, and a few years from now those who to-day are deluding themselves in the belief that they have a long life for their existing tracks will awake to find out that even the construction of to-day is wasteful and extravagant in this respect. The joint which is accepted now as being passably fair is reducing the life of the rail to one-half or, perhaps, even one-third of what it should be.

The conclusions we are led to seem to me to be as follows:

1. That for street railway use, a hard rail will give the best results.

2. That the most economical way to secure this hardness is by increase of carbon, accepting the manufacturer's standard specifications for the other ingredients.

3. That the next step should be towards an improvement of the joints.

As is well known to all present, the writer has pinned his faith to the electric welded joint as settling the question once for all, by making the union homogeneous with the rail and possessing an advantage from an electrical standpoint in the matter of conductivity. Nevertheless the cast-welded method also demands careful consideration. It is certainly preferable to anything in the nature of splice bars that we know of, provided one glaring fault can be overcome; viz., the softening of the steel that occurs from the large body of hot cast metal located at that point, and it would appear that some means could be devised to overcome this evil.

4. After making the joints perfect, what we have termed the "West End rail" would certainly justify its extra cost. As the analysis of each rail is embodied in this paper I need not here refer to it.

It is unnecessary to give the analysis applicable to each of these classes. I would caution, however, against the use of carbon as high as .59, as that was purposely taken high in what we term the "hard" rail in this experiment, the object being to reach an extreme. Carbon should be limited to from .50 to .55, with the usual leeway to cover manufacturing contingencies. It also remains a question whether the reduction of phosphorus to .08 (which may be done within economical limits of cost) will not give results so closely approximating the .05 of the West End rail as to make that figure an economical one. Whether or no, the certainty exists that so far as the steel is concerned, a rail of the following analysis should give a theoretical wear, if the joint is perfected, of from 40 to 50 years, viz.:

Carbon, .55.
Silicon, .10 or under.
Phosphorus, .08 or under.
Sulphur, .06 or under.
Manganese, .83 or over, not to exceed 1.00.

The great lesson I would once more emphasize is that until you get the joints perfect you need not worry about the quality of your steel; anything in the shape of steel—the very cheapest you can buy—will last longer than the joints, will permit you to keep your rails in the track.

An Aphorism from the Quarters.

"Yoh can't allus tell whaw ter put de credit by lookin' at de surface," said Uncle Eben. "De cork on de fishin' line dances aroun' an' 'tracts a heap o' 'tention. But it's de hook dat's doin' de business.—*Washington Star.*

A New Arc Lamp.

Perhaps the most essential qualifications of a satisfactory arc lamp are durability of the wearing parts and facility of renewals. High economy of operation will seldom balance a heavy repair bill or compensate for time lost in removing lamps to the shop for renewals, and in re-designing the well known Brush single and double carbon lamps, the necessity of producing durable lamps, with easily renewable parts, has been the object of special consideration.

The differential Brush arc lamp is especially valuable where a large number of lamps are run from one generator. The differential winding consists of a coil of coarse wire in series with the arc and a fine wire coil connected around the arc. Current in the coarse wire tends to separate the carbons, while in the fine wires it operates to bring them together, and the opposite forces exerted by the shunt and series windings being automatically balanced when the carbons are burning normally, if the series current is reduced the voltage at the lamp correspondingly diminishes. With differential lamps, generators can therefore be heavily overloaded. The improved Brush lamp is adjusted at the factory, and as the mechanism is not dependent upon springs for any of its movements, this adjustment can not change. Hence, the lamp runs as economically after several years of service as when first installed. It regulates so closely that the voltmeter on a circuit of lamps shows no appreciable variation.

All parts are made by special machinery and are interchangeable. There are no springs to adjust or replace.

The mechanism frame has been so modified that the armature lever is now supported by a base separate from the frame and mounted on a plate, which insulates it entirely from the frame and zinc bottom of the lamp box.

Realizing the advantage of using a lamp on circuits of either 6.6 or 9.6 amperes, the magnets of this new lamp have been so designed that when changing from one circuit to the other it is only necessary to exchange the adjusting coil for one suited to the new rating. The adjuster formerly sent out may be used for 1,200 candle-power (6.6 amperes), but should be changed to one of coarser wire when used for 2,000 candle-power (9.6 amperes). The new magnets are interchangeable in pairs with those of the old-style lamp, but new magnets for old 2,000-candle-power lamps must be always used with the new adjuster for 2,000 candle-power.

Successful operation requires at all times a perfect contact between the rod and the inside terminal. In this lamp it is necessarily a sliding contact, and the brush used keeps surface bright and clean. The new brush is one inch wide, punched out of phosphor bronze and so slotted as to present five narrow fingers crosswise to the rod. The same punching is used on both single and double lamps, the double lamp requiring two strips and the single lamp one strip bent double. When worn out the contact brush may be quickly replaced without disturbing any other parts of the lamp. The improved contact is interchangeable with the old if the new contact support bracket is also used

The two things necessary in a satisfactory carbon rod clutch, absolute uniformity of grip irrespective of the condition of the rod, and a means of accurate adjustment for wear of the rod or clutch, are found in the improved clutch. The surfaces bearing on the rod are so long (one and one-fourth inches) that the grip is not affected by roughness, dirt, or even dents in the rod. To adjust the clutch the position of the trip is changed by loosening one screw only.

The carbon-holders have a grip on the carbon. The upper holder is made in two sizes, taking seven-sixteenths-inch or one-half-inch carbons and nine-sixteenths-inch or five-eighths-inch carbons respectively. It may be supplied with a flange to prevent injury to the rod in case of a flaming carbon. The lower carbon-holder takes any size of carbon from seven-sixteenths-inch to five-eighths-inch inclusive. Its position is adjustable. To enable them to resist corrosion the holders are nickel plated.

The starting resistance is wound on a separate frame, which may be quickly removed, as only one screw with a metal clamp secures it to the side frame of the lamp mechanism. The cutout is operated by the mechanical movement of the armature. When the current is too weak to energize the magnets, the armature falls by force of gravity, throwing the cutout into circuit. Its contact surfaces are broad, and, as they are vertical, dust can not collect on them to prevent good connection.

When lamps are to be used indoors or in protected position, sheet-iron casings are furnished, but if they are to be exposed to the weather, especially near salt water or in a location where corrosion of the iron is likely to take place, the use of a copper casing is recommended. By simply pressing a spring clip on the upper side with one hand the casing may be removed. No solder is used in assembling the lamp and no tool but a screw driver is required to take it apart.

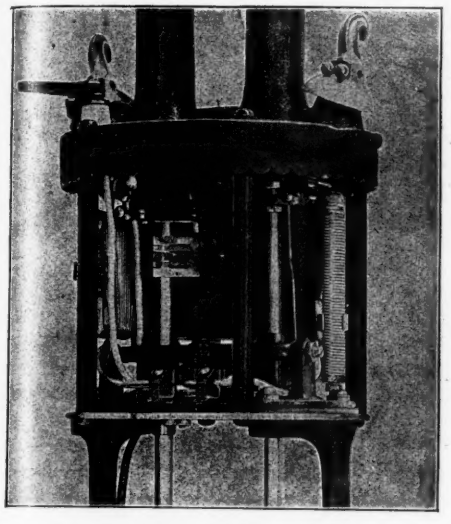


FIG. 1.—BRUSH ARC LAMP.—MECHANISM WITH CASING REMOVED.

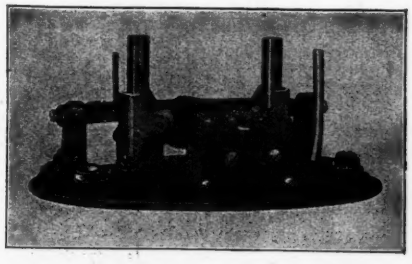


FIG. 2.—SUPPORT FOR ARMATURE LEVER.

FIG. 3.—DOUBLE-CARBON AND BRUSH INSIDE TERMINAL.

FIG. 4.—CLUTCH WITH ROD RELEASED.

FIG. 5.—CLUTCH SHOE, SHOWING LOCATION OF PIVOTS.

FIG. 6.—THE CUTOUT.

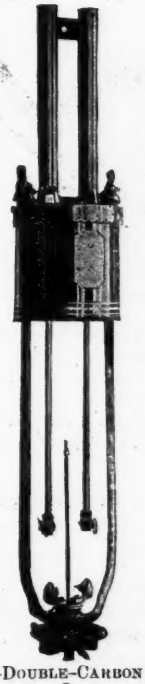


FIG. 7.—DOUBLE-CARBON BRUSH ARC LAMP.

FIG. 8.—SINGLE-CARBON BRUSH ARC LAMP.

TELEPHONE NEWS AND COMMENT.

Beaumont, Tex., is now connected by telephone with the principal cities and towns of the state.

The Central Union Telephone Company now has 3,200 telephones in use at Indianapolis. The new Irvington exchange has been put in operation.

The Philadelphia Bell Telephone Company has purchased land at Seventeenth and Filbert streets, on which a sub exchange will be built.

The Standard Telephone Company, of Atlanta, Ga., expects to finish its underground work in about a week, and to begin operating its exchange on January 1.

The New Telephone Company, of Indianapolis, is installing its underground work and expects to be ready for business by January 1. It claims to have 2,800 subscribers.

The Jefferson & Warren, Ohio, Telephone Company will build a branch line from Cortland to Orangeville, Kinsman and Andover. At Orangeville the line will connect with the lines of the Mercer Telephone Company.

The People's Telephone and Telegraph Company has been organized to do business in Worcester, Mass.; the following are the temporary officers: President, Israel L. Currier; treasurer, Frederick W. White; clerk, Chas. S. Park; directors, Frederick W. White, Dr. H. L. Wheeler, John B. Simard, W. C. Pierce and I. L. Currier.

A special meeting of the stockholders of the New York & New Jersey Telephone Company will be held in Brooklyn, N. Y., on October 27 to vote upon a proposition to increase the company's capital stock from $5,000,000 to $8,000,000. The proceeds will be applied to extensions and the new stock will be offered to stockholders at par.

By the completion of the line to Eureka recently, California has a telephone line 800 miles long. Mayor Phelan, through the courtesy of President Sabin, of the Sunset Telephone and Telegraph Company, opened the line by talking to the Mayor of Eureka and congratulating him on the opening of the fair at that place. The telephone line will eventually extend from San Diego to Spokane.

The Sunset Telephone and Telegraph Company recently laid a new 4,000-foot cable under the bay at Coronado Beach, Cal., in 40 minutes, under the direction of Superintendent Jeffries. The improvements now being made by the telephone company on Coronado Beach, including the cable, will cost $6,500. A large number of subscribers has been secured, the proportion to population being very large.

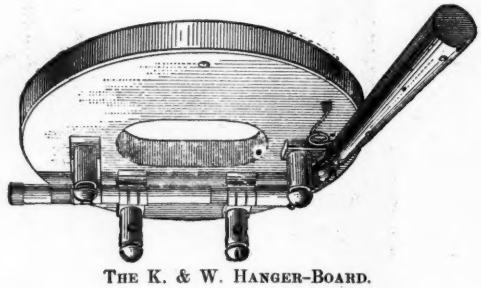
The York, Pa., Telephone Company and the men who represent the northern part of the county, L. N. Bailey and W. D. Menear, of Dillsburg; S. Harlacker, Wellsville; C. Elicker and B. H. Hamme, Rossville, and R. J. Belt, Wellsville, have formulated a deal to run the York telephone system to all points north of York at once. The telephone connections will be Weigelstown, Dover, Cralltown, Wellsville, Davidsburg and Dillsburg.

The main telephone exchange of the Cleveland Telephone Company at Cleveland, Ohio, described in the ELECTRICAL REVIEW for August 31, 1898, is attracting attention. Recently the exchange has been inspected by Saitaro Oi, the minister of communications of Japan; John Cassidy, of the Mutual Telephone Company, of Honolulu, and W. E. L. Gaine, general manager of the National Telephone Company of Great Britain. Mr. Oi stated that the telephone has attained the highest degree of efficiency in the United States, and the system in Cleveland is the most complete he had ever seen. There are 7,000 subscribers to the exchange at Tokio.

At the annual meeting of the stockholders of the Philadelphia Traction Company the following directors were elected: P. A. B. Widener, William L. Elkins, Thomas Dolan, James McManes, J. B. Altemus, George W. Elkins. George D. Widener was elected president; William L. Elkins, vice-president, and Alexander Rennick, secretary and treasurer.

Construction of "K. & W." Hanger-Board.

On this page is illustrated the K. & W. hanger-board and absolute cut out combined, which is manufactured by the K. & W. Company, Pittsfield, Mass. The board has been designed to meet the various requirements occasioned by the different types and makes of arc lamps. The base is of slate, japanned black, and is made solid or with an oval hole in the center large enough to pass the stack of a single or double-carbon lamp. The methods of lamp suspension are simple, and are suitable for lamps with terminals close together or wide apart, or for lamps supported by a single eye at the center. The hanger-board is also well adapted for attaching to lamp hoods. The slide-rod is actuated by an insulated handle controlled by a spring, which throws the handle either side of the center. The handle is drilled for the insertion of a cord for operating it at a distance. It can also be operated by hand or with a pole. The contacts are of phosphor bronze, and all parts are dipped or polished and lacquered, making a board of handsome appearance. The operation of the slide rod is first to shunt the lamp and then cut it in or out entirely, and absolutely without sparking. The reception the board has met bears evidence of the high grade of workmanship for which all the products of this progressive company are noted.



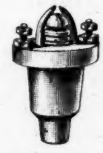
THE K. & W. HANGER-BOARD.

Diamond Electric Company Assigns.

The Diamond Electric Company has made an assignment for the benefit of its creditors to David H. Roblin. The Chicago office of the insolvent concern is at 1202 Fisher Building, and A. M Searles is president of the company. The assignment was precipitated, it is said, by the entering in the United States court of a judgment of $10,760 against the electric company in favor of the John A. Roebling's Sons Company, wire manufacturers. The sheriff levied on the factory of the Diamond Electric Company at Peoria, and when this information reached the Chicago office the assignment was at once made.

A New Electric Gas Lighting Burner.

The illustration herewith shows a new form of burner or tip to be employed in connection with series electric gas lighting apparatus. It presents a number of novelties and is intended as a substitute for the common lava tip in the ordinary pillar burner, the base being arranged to fit the metal socket designed to carry the common lava tip. The novelty consists in the use of porcelain instead of "steatite" or lava. It is claimed by the manufacturers that lava is a poor insulator where currents of high potential are employed, such as are produced by the frictional machine or Rhumkorff coil, the usual generator in such cases. In the new tip porcelain is substituted, as it has proved itself to possess higher non-conducting characteristics and to be less liable to breakage either through accidental blows or on account of temperature due to the flame. This makes the new tip more durable and lasting and permits of a greater number being lighted in one series.



A NEW ELECTRIC GAS LIGHTING BOGART BURNER.

The top of the body is provided with grooves in which the electrodes are located, which prevents the latter from shifting from their proper position, and thus changing or increasing the length of the spark gap for which they are originally set. Another new feature consists in the means for attaching the circuit wires to the electrodes. Heretofore this has been achieved by providing holes in the electrodes which project beyond the body of the burner. In the improved form binding screws are supplied by which a sure connection can be made with great ease and neatness, the nuts being prevented from becoming lost by the heading of the upper end of the screw.

The tip is very attractive in appearance, being white, but may be colored to match the tint of the candle-burner upon which it is mounted. The new porcelain tip is being manufactured by the A. L Bogart Company, of 123 Liberty street, New York city, who are making a specialty of this class of apparatus.

Electrical Progress in British Columbia.

United States consul Abraham E. Smith, writing from Vancouver, B.C., under date of September 2, gives the following information:

One of the most important improvements in Victoria during the present year has been the extension of the wires of the Western Union Telegraph Company to this point. This line has been in operation since June 9, and has had the effect of cheapening rates and of securing prompt and satisfactory communication with the United States at all times. The Western Union Telegraph Company, being incorporated under the laws of the United States, has no right to operate in Canada, and consequently the line connecting with Port Angeles, Wash., is operated by a company known as the Great North Western Telegraph Company, connecting with the Western Union Telegraph Company.

The new line has a cable across Puget Sound, from Seattle to Port Townsend, thence by land to Port Angeles, thence a cable across the straits of Juan de Fuca to Albert Head, and thence by land to Victoria. The result has been of great advantage in communicating with the United States, especially to the great American newspapers, which generally get the first news from the North and from the Orient at this point. Since this line was built, the Canadian Pacific Railway Company has also laid a cable from Victoria to Port Angeles direct, so that now Victoria has two telegraph lines direct to the United States. Each company has duplex machines, by which two messages can be sent and received on the same wire at the same time.

During the past month the work of conducting power from the Sooke Mountains, 18 miles distant from the city, for the tram road and the illumination of Victoria by electricity has been completed. The water from the mountains starts 2,300 feet above the level of the sea, and is the highest fall in Canada. About 700 feet above sea level and 16 miles from Victoria these waters form a lake covering 150 acres, into which empties Goldstream River, which is tapped three miles from its source by an artificial lake or reservoir covering seven and one-half acres, 1,122 feet above sea level. From this reservoir the water passes through a steel pipe, 33 inches in diameter, 6,700 feet to the powerhouse of the electric company, which is 460 feet above sea level, thus giving a fall of 1,000 feet from the main lake, and through which 15,000,000 feet of water pass every 24 hours, and forming 1,500 horse power.

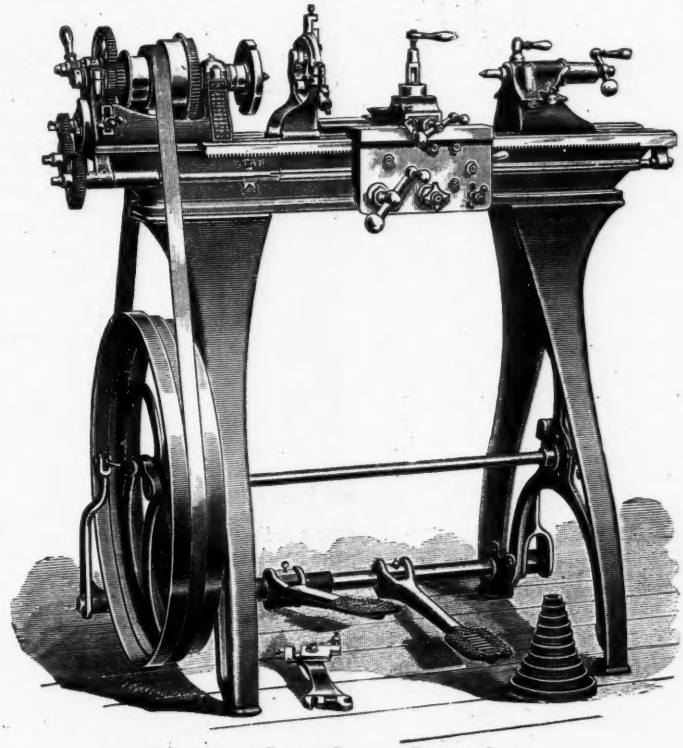
The practically inexhaustible supply of water is regulated by automatic governors, insuring steady action of the dynamos. In the power house, located at the foot of a mountain, is an electric plant without a rival for size and completeness on the North Pacific coast. All electrical machinery has been furnished by an American firm, Hasson & Hunt, of San Francisco.

From the power-house the electric current is carried on six copper wires, twenty-one-hundredths of an inch in thickness, 12 miles to the city, and furnishes power sufficient to operate the street car and electric light systems, and offices and factories in addition. Besides furnishing this motive power, the water is excellent for drinking purposes, and is now used throughout the Esquimalt Peninsula, including the British naval station and Victoria West. It is the largest work of the kind in western Canada, and, after an inspection of the mammoth machinery, the miles of ditching and piping, the dam construction, the amount of general work accomplished and its successful result, the expense of nearly $250,000 incurred does not seem excessive.

Dawson, the Klondike metropolis, is to be illumined by 2,800 electric lights by November 1.

The "Star" Screw-Cutting Engine Lathe.

The Seneca Falls Manufacturing Company, 420 Water street, Seneca Falls, N. Y., are the manufacturers of the screw cutting engine lathe illustrated herewith. This lathe can be operated by either foot or steam-power and has automatic cross-feed. When operated by foot-power the machine may be stopped or started instantly, and can be run with both feet sitting or one foot standing, as desired.



THE "STAR" SCREW-CUTTING ENGINE LATHE.

The head has a hollow spindle made from a crucible steel forging, and the bearings are of an improved end thrust, ball-bearing type, made of phosphor bronze. The tail stock has an adjustable side movement for turning tapers. A plain gib rest is provided and the tool post has an improved collar and shoe for raising and lowering the tool.

The automatic friction cross and longitudinal feeds are actuated by a phosphor bronze worm on the lead screw, which is splined, and for all work except screw cutting it simply acts as a feed rod, and therefore the only wear on its threads is in screw cutting. The feed may be thrown in or out of contact by simply turning a hand knob in the apron, and will feed in or out, right or left, cut screws right or left, or may be thrown out of gear entirely by moving a lever in the head stock, without changing the motion of the foot or driving power. The cross-feed is valuable in a large variety of work, as it secures perfect accuracy in turning or facing up work, and with the addition of simple fixtures, which can be made by any ordinary workman, light milling may be done. The lead screw is provided with an open and shut nut, which is thrown in or out of contact by means of a cam lever in the apron. It will cut all standard threads, from three to 64, inclusive, without compounding the gears, and nearly all threads by compounding them.

ELECTRIC LIGHT FLASHES.

The Patton Grand Opera House, at Albuquerque, N. M., will be lighted by 350 electric lights. Two hundred and seventy-five of these will be in the auditorium proper. The stage will have 175 lights.

At the fourteenth annual meeting of the stockholders of the Johnstown, Pa., Electric Light Company, W. H. Rosensteel, Jr., Charles F. Kress, Jame G. Ellis, Fred Stammler, Scott Dibert, Joseph Friedhoff and James Quinn were re-elected directors; Curt G. Campbell, treasurer, and Charles C. Wehn, corporation clerk. W. H. Rosensteel, Jr., was elected president of the board of directors.

The North Hudson, N. J., Heat, Light and Power Company has been incorporated. The capital stock of the company is placed at $2,000,000, of which $14,000 is paid up. The incorporators of the new company are Albert R. Carlton, of Elizabeth; Frank Stillman, of Rahway; Samuel Hathaway and George W. Waite, of Jersey City; David Young and George Roe, of Newark, and Arthur K. Bonta, of Hoboken.

The Port Chester, N. Y., Electric Lighting Company has just purchased the plant and franchises of the Westchester Gas and Electric Company, and will begin in a short time to build an entirely new plant to supply the villages of Port Chester, Rye, Harrison and Mamaroneck. The capital stock of the new company is $50,000, and the officers are William E. Ward, president; J. Addison Johnston, vice-president; William L. Ward, treasurer, and Walter S. Comby, secretary.

J. C. Hubinger, of Keokuk, Iowa, has purchased the controlling interest in the Muscatine Electric Railway franchises, plants and properties, valued at $300,000.

COST OF ELECTRIC POWER FOR STREET RAILWAYS AT THE SWITCHBOARD—STEAM AND WATER-POWER.

READ BEFORE THE AMERICAN STREET RAILWAY ASSOCIATION, BOSTON, SEPTEMBER 9, 1898, BY R. W. CONANT.

(Concluded from page 219.)

Group No. 3 indicates the cost of power for this station. At the extreme left is standard; the next column showing costs per kilowatt-hour, averaged for one year. At the extreme right of the group is the average for a light month, and at the left of this is the month of high output. It is to be noticed that the total cost of operation for the year is somewhat greater than standard; coal expense practically the same; labor and general expense somewhat higher. Coal expense, being the same, does not in this instance indicate that the economy of the station is as good, as, by referring to the table, it will be seen that the pounds of coal per kilowatt hour is 2.61, as against 2.2 for standard. This increase is, however, nearly balanced by the reduction in the price per ton, which was $2.60, as against $3 for standard. It might be expected that, on account of the diminished size of the station, the labor expense would be larger on account of requiring more men per 1,000 kilowatts. An examination of the table shows, in fact, that the men per 1,000 kilowatts is nearly double what is required for standard. This would double the labor expense, providing the rate of pay and load factor remained the same, but, by a coincidence, the rate of pay is lower and the load-factor enough higher to bring the labor expense to nearly standard figures.

To illustrate the effect of a high load-factor in reducing the cost of labor per kilowatt-hour it will be interesting to look at the next shaded column for this station, which represents the cost during January. In this month the load-factor was 59, as against 46 for the year, and it will be noticed that the labor is reduced to less than the standard. The reduction in the total cost for this month, as against the yearly, is also apparent, and this is due principally to the reduction in labor.

It will be seen that the coal expense is but slightly less, and seems not to be much reduced by the increased load-factor. The explanation of this lies in the fact that the station is tied in with others, which keeps its load from fluctuating even on the low load-factor. This will be still further exemplified by referring to a light month; the column at the right of the group gives the costs for September, during which the load factor was 43, as against 59 for January. The coal expense is still further diminished, and, by reference to the table, will be found to be due to an increase in the efficiency of the station. This might be found to be on account of not having to force the boilers. The increase of labor due to the low load-factor is to be noticed.

I wish to say at this point that it is impossible for me, in the limited time, to give you more than a general idea of the large number of interesting facts which may be obtained by careful study of the tables.

Plant No. 2 is somewhat larger than the last, and is equipped with two 1,000-kilowatt generators direct connected to compound-condensing engines. It has also economizers and heaters. Its costs are in column No. 2. In looking at the yearly average, it will be noticed that the total costs rise above the standard, and are due to an increase in labor and general expense. Coal, as before, is the same, the decreased deficiency being balanced by the lower price per ton. Examining the table with a view to accounting for the increase of labor, we find the load-factor approximately the same as standard, but an increase in the number of men per 1,000 kilowatts. This is accounted for by the smaller size of the station General expense is greater, as would be expected. A glance at the shaded diagram representing the heavy month for this station, gives a nice illustration of the effect of the high load-factor, which is 51, as against 33 for the year. It is to be noticed that the coal is practically the same, the reduction coming in the other two items. This brings the total cost for the month below standard. In the light month, with a low load-factor of 28 per cent, the labor increase is very apparent.

I shall now present the costs of operation of a large station. Its equipment consists of six 1,200 kilowatt generators direct-connected to triple condensing engines, two 1,500 kilowatt generators direct-connected to compound-condensing engines and an auxiliary plant of 40 62 kilowatt generators belted to compound-non-condensing engines, and only used in case of emergency. Economizers, heaters and electric feed-pumps complete the important part of the equipment.

Group No. 4 indicates the costs for this station. The yearly average shows that we are approaching standard figures in labor. This item is not much less, as the units are only slightly greater capacity. Load-factor, rate of pay and men per 1,000 kilowatts correspond very closely with standard. The general expense and coal bring the total somewhat higher. General expense is high on account of the heavy repair account. The station is about eight years' old and repairs are heavy, due to replacing of worn-out parts. The decrease in efficiency, as shown by pounds of coal per kilowatt-hour, might be shown by a test to be due to old boilers.

The plants just considered have all been direct connected. Station No. 5 is a belted plant a little more than one-half the capacity of the standard, equipped with seven 340-kilowatt generators belted to a countershaft, to which are belted three triple-condensing engines, the auxiliary apparatus affecting the economy of the station being economizers and feed-water heaters. Diagram No. 5 represents the costs of a year, and also for the heavy and light months. During the three periods the coal expense remains about the same, but there is considerable variation in the other items, due principally to the change of load-factor.

Notwithstanding the high load-factor, 52 per cent of the labor for the year is still above standard. This would be expected from the multiplicity of parts to look after in a belted countershaft station. The reduction of general expense and labor in the heavy month is due to the load-factor of 64 per cent.

Diagram No. 6 represents the costs for a belted plant of about one-fifth the capacity of standard. Its equipment is 12 generators belted to four simple high-speed non-condensing engines. There are feed-water heaters, but no economizer. High coal consumption is the feature of this diagram, the cost of fuel alone for the year being equal to the total operating expenses for standard. Labor is also high, and the total cost of power per kilowatt hour is nearly double the operating expense of standard. This station furnishes a good illustration of the effect on the cost of power of a simple non-condensing belted equipment. It is to be remarked also that this plant has the benefit of a high load-factor.

It will now be interesting to turn our attention to a small direct-connected station, which is numbered one. This operates about 30 cars. It is equipped with three 200-kilowatt generators, has compound-condensing engines, heaters, but no economizers. It does not feed in with other stations, as do those which have been previously mentioned, and has a very fluctuating load, as may be imagined in the operation of so small a number of cars. This station is just one-sixth the size of the standard, and it will be noticed that the column representing its operating expenses is about twice as high. The great increase is in the labor, although the station is operated by a corporation which has had a vast amount of experience in railroad work. Can we account for this increase in labor? By referring to the table we find the rate of pay of men is practically the same as standard, the load-factor is low—22 per cent, as against 33.

Referring to the heavy month for this station, which has the benefit of a 30 per cent load-factor, we find that the labor is reduced, but it is still a long way from bedrock figures. The examination of the table discloses the fact that the increase comes in the men per 1,000 kilowatts, being about 2.5 times the standard figure. The station records show the following men operating: On the first shift, two engineers and one fireman; second shift, one engineer, one oiler and one fireman; third shift, one engineer and one fireman. Can this number of men be reduced? In a station whose equipment requires that the boilers be hand fired it is, to say the least, difficult to imagine that the boilers could be operated with less than one fireman per shift. The secret then for the large number of men per 1,000 kilowatts lies in the small number of kilowatt capacity. These same men could look after a station of greater capacity.

I shall next give the costs on plant No. 12, whose figures are presented in table No. 2. This plant is about one-third the size of standard. It does not feed in with other stations. Its generators are belted to three tandem compound-condensing engines, which operate under steam pressure of 110 pounds. It has water-tube boilers averaging four years of service, heaters, but no economizers. A good quality of bituminous coal is used, which costs $2.93 per ton. By reference to the table it will be seen that this station produced power to the extent of 23 per cent of its capacity during the past year at 1.49 cents per kilowatt-hour, including fixed charges, the operating expenses alone amounting to a little over one cent. The total cost of operation for the year was $23,000, of which $13,610 was for coal. Water costs this station nothing, and the labor was about one-half the coal bill. By referring to the diagram No. 12 it will be seen that the coal and labor are both much higher than the standard, and if standard performance had been reached a saving of $10,000 would have been made in the operating expenses for the year. An analysis of the items is given in column No. 12 of the table, and by comparing with standard the differences may be readily seen I do not wish to be understood in making these comparisons that it would necessarily pay to make the changes required to effect this saving, my present idea being to bring clearly before you the differences.

Station No. 13 is an interesting combination of cheap coal, simple, non-condensing engines direct-connected to the generators, together with a high load-factor. Its capacity is 70 per cent of the standard, major part being three 800-kilowatt generators; the smaller unit is 200 kilowatts. It produced power to the extent of 42 per cent of its capacity at .96 cents per kilowatt-hour, inclusive of depreciation and fixed charges. The depreciation is charged in at five per cent on

a capital expenditure of about $60 per kilowatt. The total expense for the year was $92,617.28, which is made up of—

Labor	$15,453.25
Repairs and renewal of steam plant	1,839.69
Repairs and renewal of electrical plant	56.71
Fuel	44,780.94
Water	4,405.40
Oil, waste and lubricants	1,881.53
Tools, appliances and supplies	634.23
Taxes	1,945.65
Insurance	2,146.94
Interest	11,472.94
Depreciation, 5 per cent on $160,000	8,000.00
	$92,617.28

The analysis of these items is given for comparison with standard in column No. 13 of table No. 2. The diagram shows labor for this station to be equal to standard, principally on account of high load-factor; the other differences are also apparent. It is interesting to note that the road operated by this power-station used on an average about 1.3 kilowatt-hour per car mile. The total car miles for the year were 7,207,308, about 10 per cent of this mileage being trail cars. There are other interesting data about this road which time will not permit me to review.

Plant No. 15 is an interesting example of what a multiplicity of units will do for labor, the figure being 6.3 men per 1,000 kilowatts. The effect of this would be much more apparent on the diagram were it not for the high load-factor and low rate of pay.

Plant No. 16 is of 1,600 kilowatts capacity. The cost for power for past year was $53,000. Load factor is the same as standard. Standard operates to produce about double the output for the same figure.

Station No. 28 is 1,400 kilowatts capacity, has slow-speed, condensing engines, heaters and economizers. The feed-water leaves economizer at the high temperature of 258 degrees. The engines are simple belted to the generators, and coal costs but $1.63 per ton.

Plant No. 29 is a compound condensing, slow-speed belted station of 1,900 kilowatts capacity, and feeds in with another station. The coal costs $3.86. Plants Nos. 30 and 31 are operated by the same corporation as No. 29.

No. 32 is a combination of two power-houses feeding into the same system. These stations are interesting, because these costs are for the past year, and since then these two stations, as well as smaller ones operated by the same company, have been consolidated into a large water-power plant, from which power is transmitted at 13,000 volts. The two steam stations shown in column 32 have five triple-expansion condensing engines. This road operated on about 1.4 kilowatt-hour per car mile. The coal costs $3 per ton. The water-power plant which replaced the steam has not been in operation long enough to enable its costs to be given.

Station No. 33 has rather a tall column, due principally to its low load-factor of 16 per cent.

Station No. 34 operated at a lower cost than standard on account of the high load-factor, 57 per cent, reducing the cost of labor and low price of coal $1 per ton.

No. 35 is a plant of 1,200 kilowatts capacity, interesting on account of the fact that it has but one unit. It operates with 2.1 men per 1,000 kilowatts a load factor of three per cent coal, costing $1.24 per ton. Its costs are quite a little lower than standard.

No. 37 is a record breaker in the opposite sense. It is of slightly greater capacity than No. 35, but has three engines and 11 generators, which require eight men per 1,000 kilowatts capacity. It has a load-factor of but

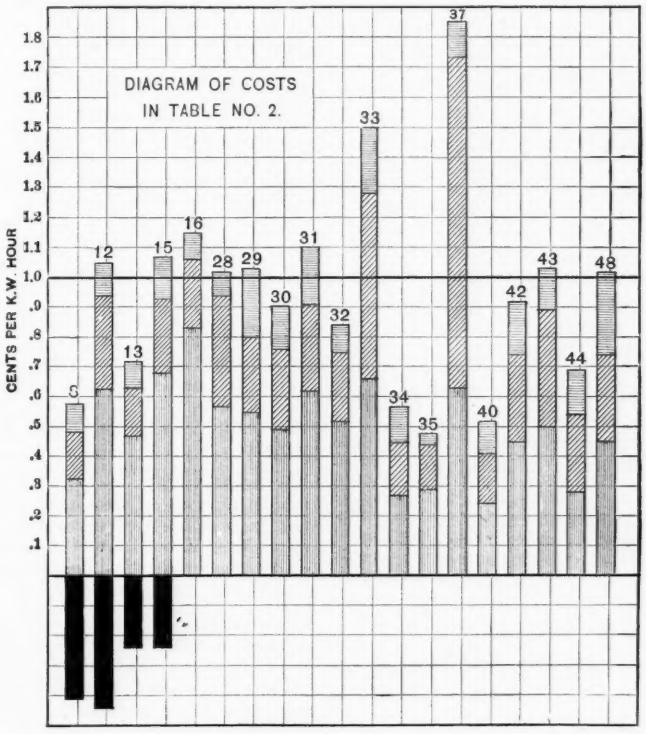


Diagram of Power Costs.

11 per cent during 151 days from January 1 to May 31, 1898. The effect of this on the cost of labor is very apparent.

No. 40 has a capacity of 9,200 kilowatts. It is direct-connected, has economizers and compound condensing engines. Anthracite coal is burned, costing $1.60 per ton. This plant operates at less than standard figures.

No. 42 is a belted plant, compound non-condensing engines, heaters, but no economizers. It has a good load-factor, but the effect of the belted and small units shows in all three items.

No. 43 is a combination of alternating and direct-current apparatus. It has a low load-factor of 15 per cent, the effect of which is noticed on the labor.

No. 44 is a 6,000-kilowatt station, and although belted, has large compound-condensing engines and economizers, which, with coal at $1.60, bring the cost of fuel below standard figures.

It will now be instructive to take a general survey of the shaded diagram for all stations in table No. 2. No. 37 towers above all the rest. Standard is at the extreme left. Coal in No. 37 is greater than the total operating expense for standard. This station pays but $1.75 per ton, but it uses 7.3 pounds per kilowatt-hour. Compare this with No. 35, about the same size plant, paying $1.24 for coal, and using but 4.7 pounds per kilowatt-hour.

I can hardly ask you to compare the labor, but it is easily seven times as large in No. 37 as in No. 35. The load-factor of 11 per cent, as against 37 per cent, would make this item three times as great, and men per 1,000 kilowatts eight per cent, as against 2.1, would again increase the cost of labor three times. The higher rate of pay in plant No. 35 prevents the discrepancy being greater.

Let us look along the line for high coal cost. No. 16 seems to bear off the palm in this respect; $3.30 per ton and five pounds per kilowatt-hour accounts for this. For strikingly low costs we have Nos. 34, 35 and 40.

But I am afraid that I hear somebody remark that I am making comparisons that may result in unfavorable criticism, and that I promised not to do, and therefore I will let the diagrams and tables speak for themselves, and assure you that they will reward careful study.

Electricity in a Tag Factory.

The celebrated Dennison tags are now made by Westinghouse electrical apparatus. The plant of the Dennison Manufacturing Company, at South Framingham, Mass., represents an ideal type of direct-current power apparatus, well installed and operating in a manner that is entirely satisfactory to the owners. Electric apparatus of Westinghouse manufacture is used for the entire shops, the only steam plant being that which drives the generators. A complete system of arc and incandescent lighting is also in operation.

The generating plant consists of one 200-kilowatt generator running at 100 revolutions per minute, one 100-kilowatt generator of the same speed, and one 30-kilowatt machine running at 300 revolutions per minute. The machines are all of the 125-volt Westinghouse engine type. Seventeen slow-speed Westinghouse multipolar motors of from five to fifty horse-power are used for driving the shop machinery.

Expansion.

One fool used to be born every minute. Now there are two, sometimes three. The business is growing and the product is of high quality. But the biggest fool of all fools is the infernal fool who thinks he knows it all, whether he be on the farm, in the factory, or in the business office. The man who doesn't know that he can learn something by whetting up against some one else is a candidate for the lunatic asylum or the poorhouse. A man may shut himself up on his farm or in his office and be monarch of all he surveys, but his survey will be so small that it will keep him poor all his life. Expansion is the watchword of the day, and the way to expand is to get out and expand. It can not be done by sitting around and throwing bouquets at ourselves. It is the bouquets of others which come our way that count, and we can't expect to have others use us for a target unless we let them know where we are at.—*Agricultural Advertising.*

National Subway Company.

The stockholders of the National Subway Company, of St. Louis, will meet on November 5 to vote on a proposition to increase the capital stock of the company from $250,000 to $2,000,000. The law compelling electric companies to place their wires under ground in St. Louis has greatly increased the value of the company's property and franchise, and necessitated an increase in its capital.

ADVANCE INFORMATION

Electric Light and Power.

WHARTON, TEX.—G. C. Gifford has been granted franchise for lighting and water supply, and will at once arrange for erection of electric light plant.

FREDERICKSBURG, VA.—The Mayor may be addressed concerning erection of municipal electric light plant.

TRENTON, N. J.—The New Jersey Washington Light Company has been incorporated by E. Raymond Perrine, Richard H. Page, Horace M. Royal and others to operate a system of lighting; capital stock, $100,000.

STURGIS, KY.—City Clerk may give information concerning establishment of an electric light plant.

OAKLAND, MD.—The Mayor may be addressed concerning purchase of electric lighting plant, for which $25,000 has been issued.

ASHEVILLE, N. C.—F. M. Miller, Mayor, may be addressed concerning contemplated purchase of electric light plant.

LUMBERTON, N. C.—E. K. Proctor, Jr., Mayor, may be addressed concerning erection of electric light plant.

MCKINNEY, TEX.—The McKinney Electric Light and Motor Power Company has been incorporated by L. A. Scott, J. P. Nunely and D. T. Perdue; capital stock, $17,000.

OPELIKA, ALA.—The Mayor may be addressed concerning contemplated erection of electric light plant.

DALTON, GA.—City Clerk may be addressed concerning establishment of electric light plant.

CRESCENT CITY, FLA.—The Pierpont Manufacturing Company has been granted an electric light franchise for term of 20 years, the town having the privilege of purchase at the expiration of 10 years.

KINGWOOD, W. VA.—City Clerk may be addressed concerning establishment of electric light plant.

LINCOLN, ILL.—The Lincoln Gas Company has been incorporated by F. B. Ferguson, Geo. Skinner and others to furnish gas and electricity; capital stock, $10,000.

PHILADELPHIA, PA.—The International Incandescent Light Company has been incorporated, with a capital stock of $1,000,000.

MT. JOY, PA.—F. E. Bailey & Company, for the Manheim Electric Light, Heat and Power Company, have secured the franchise for lighting the streets of this place with electric lights, and expect to begin the erection of the poles and wires in a week or two. A line will be built across Rapho township, from Manheim borough to Mt. Joy, and the power will be furnished from the plant at the former place.

NEW YORK, N. Y.—The New York Gas and Electric Light, Heat and Power Company has been incorporated. It is organized with a capital of $25,000,000. The incorporators are Henry J. Hommens, Frank D. Allen, F. Allen, J. F. Yawger, Louis M. King, C. R. Flint and M. W. Smith, of New York city.

LITTLE ROCK, ARK.—The Kitson Hydro-Carbon Light and Heat Company has been incorporated. The incorporators are H. W. Perry, president; E. L. Brown, Maxwell Coffin, J. M. Steward and Ashley Cockerill. The capital stock is $500,000.

New Telephone and Telegraph Companies.

ALBION, MICH. — The Calhoun County Telephone Company has commenced operations.

URBANA, OHIO—The Urbana Telephone Company has been incorporated by D. B. McDonald, Edward L. Barber, James S. Bradley, Jr., J. H. Dimond, E. M. S. Huston and others; capital stock, $30,000.

UNION, MO.—The telephone line from here to Cross Keys, via Sedalia, has been completed.

ATHENS, ALA.—The Athens Telephone Company is extending its lines. Work is being pushed now on a line running to Westmoreland, in the western part of the county, which will take in Cartwright, Elk River Mills, Lakin, Hightower and others, making a line some 20 miles in length.

FRANKFORT, KY.—The Germantown, Brookville & Augusta Telephone Company has filed articles of incorporation in the office of the Secretary of State. The capital stock is $4,000.

GREENUP, KY.—A telephone line is to be built from this place to Grayson.

EUREKA, CAL.—Long-distance telephone extension from Usal, Mendocino County, has been completed to this city, a distance of 114 miles, which gives complete telephone communication with the outside world.

UPLAND, PA. — The Delaware County Telephone Company have commenced the construction of their line to this place.

GEORGETOWN, DEL.—Arrangements are now being made to extend the telephone line from here to Milton, and also from Seaford to Bridgeville. When this is done the principal towns in the lower part of the state will be connected by telephone.

WASHINGTON, GA.—Ben A. Neal and Clark Grier have obtained a franchise for and will construct a telephone system in this place.

LOUDON, TENN.—The new telephone exchange at this place has been opened up for business.

MEDINA, OHIO—The Medina Telephone Company has been incorporated to build and operate a telephone line; capital stock, $20,000; incorporators, Samuel B. Rawson, T. M. Brush, A. E. Lord and others.

BRIDGEPORT, VT.—The Champlain Telephone Company are about to extend their line across the lake.

DENVER, COLO.—Bids are asked for for the furnishing of poles for a new telephone line, which is intended to connect Pinkhamton, in North Park, with Laramie, Wyo.

LORAIN, OHIO—Officials of the Black River Telephone Company recently entered into a contract with the Ohio Telephone Toll Line Company for the construction of a line from this city to Elyria, to connect the local system with that company's line. Later the local exchange will be connected with the Home Telephone Company at Cleveland.

AMHERST, MASS.—The Amherst Telephone Company has been incorporated; capital, $4,000.

New Electric Railways.

PORT ANGELES, PA.—E. W. Chillis, of Erie, Pa.; John Cain and Geo. H. Clementson, of this place, have made an application for a street railway franchise.

MINNEAPOLIS, MINN.—The Minneapolis & Champlain Suburban Railway Company has been incorporated, with capital stock at $50,000. The incorporators are Clifford D. Staples, president; Lorenzo L. C. Brooks, vice-president; F. D. Woodbury, secretary; Emory W. Hill, Collinwood Evans, Henry M. Morton, Anthony Chryst.

CLYDE, N. Y.—It is reported again that a movement is under way for the construction of an electric railroad from Waterloo, via Clyde, Rose and North Rose, to Bonnicastle. New York capitalists are interested in the project.

SYRACUSE, N. Y. — There is a project on foot to establish a trolley line from this place through to Oswego, as an extension of the Lakeside road from Baldwinsville, Phœnix, Fulton and Oswego Falls.

ANNAPOLIS, MD.—A new electric railway is to be built to run from Baltimore through Anne Arundel County to Gibson's Island or Mountain Bar; capital stock of the company placed at $50,000.

RICHMOND, VA.—City Clerk of King William may give information concerning proposed erection of electric railway from Richmond through Henrico, Hanover and King William.

PORTLAND, IND.—The Portland & Camden Railroad Company has been incorporated by Frank S. Vine, James Droege and others to operate an electric railway between Portland and Camden; capital stock, $50,000.

ST. LOUIS, MO.—The Electric Connecting Railway Company has been incorporated by John H. Bobring, J. D. Houseman, Jr., and others to build and operate an electric line to Kimswick and De Soto; capital stock, $2,000.

GASTON, IND.—Ozora Sharp is reported to be interested in the construction of an electric line in this city.

New Incorporations.

CHICAGO, ILL.—The Eureka Electric Company has been incorporated; capital stock, $10,000; incorporators, J. Kusel, Arnold Cohn and H. J. Kusel.

NEWARK, N. J.—The Atwood Power and Speed Gauge Company has been incorporated to manufacture electrical and steam measuring instruments, etc.; capital, $75,000; incorporators, George F. Atwood, Orange, N. J.; Harry A. Fields, New York city; George R. Swain, Newark, N. J.

DETROIT, MICH.—The American Electro-Neurotone Company has been incorporated; capital stock, $30,000. The stockholders are Fred W. Christie, Niagara Falls, N. Y., 40 shares; Daniel R. Stevens, Toronto, Ont., 840; Rollin H. and Clara B. Stearns, Pine Bluff, Ark., 10 each; R. L. Gibson, Toronto, 10; L. G. Christie, Toronto, 50.

BRIDGETON, N. J.—The Keystone State Carbonator Company, with an authorized capital stock of $100,000, has been incorporated. The incorporators are William S. Baker, New York; Robert H. McLean, Hoboken; Alexander Simpson, Jersey City.

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ISSUED SEPTEMBER 27, 1898.

611,581 Telephone system; Geo. Ritter, Stuttgart, Germany.

611,592 Alternating-current voltmeter; H. P. Davis, Pittsburgh, Pa.—Consists of a closed circuit movable member and means for indicating the extent of its movement against an opposing force, an actuating magnet and a non-inductive resistance having a low temperature coefficient and connected in series with the main coil of the actuating magnet to compensate for changes in current frequency.

ISSUED OCTOBER 4, 1898.

611,601 Electric arc lamp; Sigmund Bergmann, New York, N. Y.

611,638 Signal apparatus; H. G. Leopold, New York, N. Y.

611,707 Electrical connector; J. Pedriali, Brussels, Belgium—Consists of male and female parts, the former consisting of a handle of insulating material provided with a plug projecting therefrom and carrying at its extremity an enlargement or head, and the latter consisting of a hollow plug of insulating material and containing a U-shaped spring, the extremities of which are provided with contact plates between and beyond which the head of the plug passes, said U-shaped spring being reenforced by other springs located each side thereof.

611,719 Electrical circuit controller; Nikola Tesla, New York, N. Y.—The combination with a closed receptacle, of a circuit controller contained therein and surrounded by an inert insulating medium under pressure.

611,722 Electrical measuring instrument; E. Weston, Newark, N. J.—An instrument provided with a movable coil, pivot-supporting plates having axially-drilled holes, in combination with pivot pins or bearings secured therein by forcing them endwise.

611,723 Index needle or hand for electrical measuring instruments; E. Weston, Newark, N. J.—An index needle or hand consisting of a supporting part provided with one or more counterweights, and a body part having a flattened pointer provided with a stiffening bead.

611,724 Electrometer; E. Weston, Newark, N. J.—An electrometer having its quadrants so arranged as to constitute a disk-like field and a disk-like armature or needle sustained upon a pivot shaft and adapted to rotate in said field, with a metallic casing surrounding all of said parts and insulated therefrom.

611,760 Surface contact railway system; W. B. Potter, Schenectady, N. Y.

611,778 Electric railway; Justus B. Entz, Philadelphia, Pa.

611,809 Electric meter; Sidney Evershed, London, England—A motor meter consisting of a vertical axle of magnetic material adapted to rotate with limited vertical play between upper and lower jewels or other stops, with a magnet having one pole situated above the said axle and adapted to provide a magnetic support and pivotal guidance to the said axle.

611,821 Electric railway conduit and trolley; J. H. Robertson, New York.

611,822 Electric time switch; F. M. Schmidt, New York, N. Y.—And electric supply circuit and an electric consumption circuit, a switch controlling the supply of current to the latter circuit and an electric self-winding clock energized from said supply circuit, and controlling the operation of said switch to open and close the same.

611,850 Electro-magnetic engine; P. B. Watson, Philadelphia, Pa.

611,869 Automatic switch apparatus; A. Schlatter, Budapest, Austria-Hungary.

611,861 Cloth-cutting machine; Nicholas Komow, New York, N. Y.

611,897 Electric signal device for railways; L. T. Dube, Paris, France.

611,902 Apparatus for adjusting phases of alternating currents; J. H. F. Gorges, Berlin, Germany—A circuit for conveying alternating current, a dynamo electric machine adapted to be operated by magnetic effects differing in phase, a Wheatstone bridge circuit connected with the aforesaid circuit, the dynamo electric machine having a winding which is included in the bridge of the Wheatstone bridge circuit and adjustable induction and resistance devices included in the branches of the Wheatstone bridge circuit.

611,927 Multiple rate metering system; F. T. McIntyre, Washington, D. C.—Two independent meters having their register controlling elements connected in independent branches, distributing mains, independent control wires connecting said branches with the distant central or control station, and a switch mechanism for completing the circuit through one or the other of said control wires and meter in circuit therewith.

611,943 Railway signaling; J. G. Schreuder, Edgewood Park, Pa.—Signals, a motor for shifting said signals, independent connections from the signals to the motor, a lock for holding each signal in clear position, a magnet controlling each signal connection and lock and a track circuit controlling the circuits of the motor and of the controlling magnets.

611,970 Method of, and means for, controlling energy delivered to translating devices; H. W. Leonard, East Orange, N. J.

611,971 Electrical wireman's combined gage and calculator; H. Lutz, Hamilton, Canada.

611,974 Automatic switching and telephone system; L. G. Nilson, Sioux City, Iowa—A box adapted to transmit electrical impulses, comprising a retarding appliance consisting of a pivoted balance, projecting parts extending from a passing body, and two slidable pallets adapted to be alternately moved by the projecting parts of the passing body.

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INDUSTRIAL NOTES.

The Petite Arc Lamp is fully illustrated and described in a new and tastefully prepared catalogue just issued by the Western Electric Company, Chicago and New York.

The Keystone Electric Company, Erie, Pa., have a branch office at 318 Broadway, New York, in charge of Mr. C. F. Whittemore. This company are the makers of high-grade dynamos and motors and electrical machinery.

A. C. Becken, Columbus Memorial Building, Chicago, reports a gratifying success in the demand for Paillard non-magnetic watches. These watches are just what they are represented to be, and can be safely worn by electricians among electrical machinery without fear of their being magnetized.

Holmes, Booth & Haydens, Waterbury, Ct., are making extensive repairs and additions to their plant. The Berlin Iron Bridge Company, East Berlin, Ct., have secured the contract for the steel roof work for the boiler-room, 40 by 80 feet; the new muffle room, 35 by 80 feet, and the new brass mill, 118 by 90 feet. These new additions are to be fireproof throughout. The side walls are of brick, the roof supports are of steel, and the covering corrugated iron. The roofs are arranged with skylights for lighting the interior of the building, and monitors for ventilation.

James G. Biddle, Drexel Building, Philadelphia, now has in press a comprehensive catalogue, to be known as Catalogue "B," which will be complete in illustrations and descriptions of electrical measuring instruments. It has been the custom of the Biddle office to send out from time to time circulars and price lists, and this catalogue is designed to take the place of these distributions. It includes data as to the Jagabi portable testing sets, Weston ammeters, voltmeters, wattmeters, ohmmeters, etc., Ward Leonard circuit-breakers and the various forms of Carpenter rheostatic devices and outlet boxes; also data of particular interest to college and professional men relative to the chloride accumulators, and much other matter of value to those who are concerned with electrical measurements. This catalogue will be sent on application.

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Kindred.... ...Interests

The Julius Andrae & Sons Company, Milwaukee, Wis., has just completed the work of installing a complete electric light system in the Racine, Wis., post office. The company has also equipped the Fish Brothers Wagon Works, of the same city, with a complete telephone system, and placed a programme clock system in the Wisconsin State Normal School.

The John Shillito Company, of Cincinnati, Ohio, have lately purchased 200 of the Crain Parhelion arc lamps. The award was made after exhaustive tests of all the various enclosed arc lamps which entered the competition, and for extreme simplicity, absolute regulation, and the possibility of all the parts being interchangeable, the Parhelion lamp was chosen. Mr. Geo. H. Stout, No. 1208 Sheffield avenue, Chicago, is the general sales agent of these lamps.

The Electric Appliance Company, Chicago, have just placed in the printer's hands copy for their new telephone catalogue. They claim that this will be the best all-around telephone apparatus and supply catalogue that has so far been issued. It will be ready for distribution in the course of a few weeks, and telephone companies are advised to send in their applications now, so that their names may be placed on file and the catalogue may be sent as soon as it comes from the press.

The Manufacturers and Inventors' Electric Company, 96–98 Fulton street, New York, in addition to being dealers in electrical supplies and specialties for gramophones, phonographs and phonetic supplies, have a most completely equipped workshop with modern machinery for the making of model and experimental apparatus. Mr. T. J. Smith, who has been well known in the electrical field for many years as manager of the electrical department of the E. S Greeley & Company, is the general manager of the company.

The Eureka Blow-Pipe, adapted for either gasoline or kerosene, is a convenient and durable tool. It is specially adapted for soldering, light brazing, burning paint, melting metals, heating soldering irons and other purposes, all of which are described in the neat little circular recently issued by the Western Electric Company. Sockets, switches and cutouts are the staples of the electric light business, and the demand for them comes from every class of trade. In order to meet this demand and give the customer just what he wants, the Western Electric Company has put in a varied supply of these articles.

The C. W. Hunt Company, of Staten Island, N. Y., have just issued three very attractive catalogues, relating to "industrial railways," "manila rope," and "mast fittings, coal tubs, hoisting blocks, wheelbarrows." The industrial railways are for manufacturing establishments, requiring them for handling material. A number of well-described illustrations covering all details and complete railways are given. Shop cars, crane cars, tip cars, gas coke cars, coal cars, etc., are shown in a very complete and interesting way. The manila rope is for transmission and hoisting, and its manufacture and history is treated in an entertaining and instructive manner. The third catalogue also well illustrates and describes its title subjects. These interesting documents will be sent to users on application.

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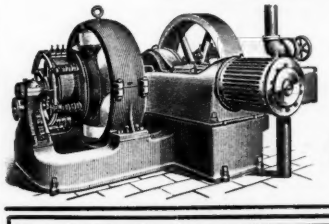

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